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A METHOD OF MOUNTING ENTOMOLOGICAL SPECIMENS IN GELATIN

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INTRODUCTION

The use of gelatin as a medium in which to mount and permanently preserve biological specimens is by no means new; it was advocated by Lee (1) at least fifty years ago. It is only within the last ten years, however, that its usefulness as a practical method for preserving entomological material has been realized. Its application to insect work was first suggested by Prof. L. J. Muchmore of the Southwest Museum, Los Angeles, California, to H. C. Lewis, who reported on the subsequent development of the technique in 1929 (3). Following this, C. W. Eagleson of the Ohio State University, improved upon the method and published a note in 1932 (4) as a further advancement in the technique. This paper, also, is intended as an advancement in the technique rather than the presentation of a total innovation.

During the past two years the method of mounting specimens in gelatin as described in this paper has been surprisingly useful in the preparation of insects for riker mounts or other display cases for exhibition and class study purposes. The advantages credited to the gelatin method as compared to the method of preserving specimens in liquids are many. Unlike the mounts prepared with liquid preservatives such as alcohol, formalin, Jackson's fluid, etc., there is no formation of a white precipitant and no necessity to replenish preservative solutions due to the loss from evaporation when the gelatin method is employed. Another advantage is that many interesting and characteristic entomological examples, such as the osmateria (scent horns) of some species of *Papilio* larvae, predators and parasites in position attacking their animal hosts, and economic pests *in situ* on their plant hosts, can be displayed to better advantage than they can in the less stable liquid preservatives. For any objects imbedded by this gelatin method not only retain their natural life-like appearance and color, but they are rigidly held in a clear, white medium. This is the most important asset of the gelatin formula. The fact that the specimens are rigidly suspended, enables them to be viewed with ease, from many angles, and to withstand much rough handling. Once the formaldehyde 40% is added to the gelatin solution as described in the technique, the resulting condensation product that is formed is a permanent gel. This gel forms quite rapidly after the formaldehyde is added and it is for this reason that the specimens have to be placed in the desired position in the glass container as the solution is cooled. After the medium has set it will not deterioate or liquify providing the mount is properly sealed.

My own method of sealing the mounts as outlined here is simple and effective and appears to be superior to the gas-flame (4) and cork (3) methods in that it obviates any danger of scorching and no vacant space remains above the medium. Furthermore one is not limited to the use of vials or glass tubes in which to seal the mounts with these two methods, as has been advocated. With this new method, any type or shape of various glass containers such as museum bottles and jars can be used to prepare attractive mounts.

We have found that the amount of formaldehyde used to prepare the mounts will not prevent the development of liquifying bacteria from breaking

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down the gelatin medium. As additional antiseptic measures, we take precautions that all glass containers in which the specimens are to be mounted are boiled in water for at least three minutes and add 2 per cent (by weight) of chloral hydrate or boric acid to the gelatin stock solution. Since employing these extra precautionary measures we have had no trouble from bacterial breakdown and our mounts have remained on perfect condtion.

TECHNIQUE

The formula and technique employed in preparing the gelatin mounts is as follows: First of all the specimens to be embedded must be properly killed and fixed so as to ensure the permanency of the mounts. Soft bodied insects should be killed by heating in water until death rigour has occurred. Then their hypodermal and sub-hypodermal tissues must be fixed to prevent them from expanding or contracting when they are embedded in the gelatin. This is done by placing the specimens in Jackson's (2), Kahle's (4), or Frehling's solution for 24 to 36 hours and then storing them in 2 per cent formaldehyde solution. Before embedding in gelatin, wash the insects in water for at least 12 hours to remove all traces of the fixative solution. Frehling's fixative is: Water 20 parts, Alcohol 15 parts, Formaldehyde (40%) 6 parts, Glacial acetic acid 1 part.

For preparing plant material showing the injury caused by insect pests, the following procedure recommended by Wormser and Hayes (5) has been found to be very useful. First prepare a solution containing 50 parts water with crystals of copper sulphate added to make a saturated solution. This is solution (A). Prepare a second solution (B) containing 14 parts of formaldehyde (40%) and 86 parts water. Boil the plant tissue in solution (A) for 10 minutes. Remove and place in solution (B) for 3 to 7 days. The green coloring obtained should be indefinitely stable.

Immediately prior to mounting all specimens, they should be placed in a small quantity of the warm stock solution for 2 or 3 minutes to replace any water or air bubbles adhering to their surface.

The gelatin stock solution consists of the following: Water 100 gms., Gelatin (refined) 10 gms., Chloral hydrate 2 gms.

To prepare, use a highly refined gelatin in order to ensure a water-white matrix that remains clear indefinitely. Add the gelatin to the water and allow it to swell or hydrate for 15 to 20 minutes. Then add the chloral hydrate and stir thoroughly. Heat this mixture in a waterbath at a temperature of 70°C. for 20 minutes, and finally filter through cotton which has been moistened with hot water. This is the stock solution and should be kept in a jar having a tight fitting lid to exclude dust or other foreign material. Each time the stock solution is used it should be heated in a water bath at a temperature not exceeding 70°C. to liquify the gelatin. When the stock solution is warm and in liquid form, it is poured so that an empty space of three-eights of an inch in depth remains at the top of the glass container in which the specimen is to be mounted. To this required amount of gelatin solution measured out in the glass container, add, with the aid of a medicine dropper, enough formaldehyde (40%) to make a 2 per cent solution, i.e., 2 cc. of formaldehyde to 100 cc. of stock solution. Then place the specimen or specimens in the medium and arrange in the desired position as the solution cools and sets. To hasten the cooling process, stand the glass container in a bath of cold water. Once the medium has gelled sufficiently, remove the mount from the cold water bath and let it stand for 24 hours to allow the medium to contract or settle. Then seal the vial or glass container. This is done by heating petroleum asphalt (softening point 170°F.) or automobile battery cement and pouring the hot liquid into the space left above the medium in the container. A mixture of resin 8 parts, beeswax 1 part, and raw linseed oil 1 part will serve the purpose also. It is essential that the vial be made

air tight, otherwise the mount is liable to break down due to liquifying bacteria or to drying. When the sealing cement has cooled and has set firmly, paint it with white shellac. A coating of white shellac over the labels on the mount assists greatly in their preservation and safe keeping also.

SUMMARY

During the past two years we have found the method of mounting specimens in gelatin, as described in this paper, to be very useful in preparing material for riker mounts or other display cases for exhibition and class study purposes. In the course of experimenting with variations in the formula and procedure the following advancements in the technique have been developed:

1. The use of antiseptic measures such as boiling in water the glass containers in which the specimens are to be mounted and adding 2 per cent chloral hydrate or boric acid to the gelatin stock solution. These are precautionary measures to prevent bacterial break down of the mounts.

2. Sealing the mounts with petroleum asphalt (softening point 170°F.) or automobile battery cement is a simple, effective procedure and enables one to employ a variety of museum or exhibition jars of different sizes and shapes to prepare an attractive mount.

3. The use of this gelatin method has been successfully applied to the preservation of plant tissue also and is offered as a suggestion for trial by other workers.

4. Hastening the cooling process of the gelatin medium by the use of a cold water bath has been found useful.

5. A protective covering of white shellac painted over the labels on entomological or botanical mounts aids greatly in their preservation and safe keeping.

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NEW NORTH AMERICAN GEOMETRIDAE WITH NOTES, I (LEPID.)*

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STERRHINAE

Protoproutia n. gen.

Similar in wing shape and in the possession of a double areole on primaries to *Euacidalia* Pack. Palpi short; male antennae finely ciliate. In the male hind-legs the tibiae are very broad and long (twice the length of the tibiae in *Euacidalia*), rather flattened with strong hair pencil, without spurs and projecting apically over the first joint of the tarsi. Tarsi extremely short and attached to the ventral surface of the tibiae. Female hind-leg normal with a single pair of spurs. The male genitalia show well-developed pointed Uncus and Gnathos in contradistinction to *Euacidalia* but the anellus lobes are undeveloped.

Genotype *Protoproutia rusticaria* n. sp. Also includes *laredoata* Cass.

Protoproutia rusticaria n. sp.

Very similar to *laredoata* Cass. but with the basal two-thirds of both wings much paler and with, in consequence, better defined maculation.

Palpi and front black, a white band between the antennae. Primaries

*Contribution from the Division of Entomology (Systematic Entomology) Department of Agriculture, Ottawa.

ochreous brown, shaded with purple-brown in basal two-thirds of wing; heavily shaded with smoky brown in subterminal and terminal areas. A fairly distinct black postmedian line, incurved at costa and otherwise parallel to outer margin, tending to be slightly broken and accentuated on the veins by dark dots. A much less distinct antemedian line, moderately outcurved and best recognized by dark dots on cubitus and vein 1. Equidistant between these and parallel to same is a dark median shade-line, containing the small discal dot. Dark terminal area crossed by a pale, irregular, rather indistinct s. t. line. A strong black terminal line, broken at veins by pale dots. Fringes purple-brown in basal half, pale ochreous outwardly. Secondaries light ochreous with broad smoky terminal band; the two outer dark lines of primaries continued across wing; a small dark discal dot and slight smoky sprinkling along inner margin. Terminal dark area faintly cut by pale s. t. line. Dark terminal line as on primaries. Fringes with basal half rather paler than on primaries. Beneath light ochreous with smoky sprinkling especially on secondaries; indications of the dark terminal band of upper side. Lines of upper side repeated but generally fainter. Expanse 16 mm.

Holotype—♂, S. W. Texas, May-June, 1928, (O. C. Poling); No. 4476 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—15 ♂, 14 ♀, same data.

The species also occurs in Arizona.

Scopula junctaria Wlk.

Acidalia junctaria Wlk., 1861, Can. Nat. & Geol. VI. 39; 1862, Cat. Brit. Mus. XXVI, 1593.
Acidalia quadrilineata Pack., 1876, Mon. Geom. 345 (*new synonymy*).

I commented (1916, B. & McD. Contr. III (1) 41) on the type of this species, then in the collection of the Ontario Entomological Society at Guelph, Ont. Later (1917, *op. cit.* IV, 5) I made some further reference to the species and was inclined to consider it the same as *persimilis* Hlst. Walker's type, a female, is now in the Canadian National Collection; it is in very poor condition and it has been impossible with any degree of certitude to determine whether it represented what has passed under the name *quadrilineata* Pack. or whether it was correctly associated with *persimilis* Hlst. I have therefore made a slide of the genitalia, comparing it with similar slides made from undoubted specimens of *quadrilineata* and *persimilis;* I find that the type genitalic slide agrees excellently with the one of *quadrilineata* and not with that of *persimilis;* in consequence the above change in synonymy is indicated, the name *persimilis* Hlst. being resurrected for the species with less angular hindwings and a non-scalloped s. t. line on underside of primaries.

Scopula siccata n. sp.

Male antennae very finely ciliate, much as in *fuscata* Hlst. Palpi short-scaled, pale ochreous, mixed with some black on outer side of second and third joints. Front blackish, with admixture of whitish along anterior margin. Thorax and abdomen light buff. Hind legs as in *fuscata;* tibiae in ♂ not laterally compressed, with single pair of spurs and without hair-pencil; tarsi normally long. Wings light ochre-buff with a scattered sprinkling of brownish scales and the terminal area beyond the postmedian line smoky brown, forming a more or less evident dark terminal band. Antemedian line faintly evident on primaries as a brownish outcurved line; median shade strong, broad, brownish, more or less parallel to outer margin, bent in slightly in submedian fold of primaries and containing, on secondaries only, a small blackish discal dot; postmedian line distinct, narrow, brownish, very slightly irregular, especially on secondaries, in general parallel to outer margin. Faint indication of a wavy pale s. t. line through the dark terminal space. A strong dark terminal line. Fringes concolorous. Beneath much as above with the maculation somewhat better defined, especially the postmedian line. Expanse 21-25 mm.

Holotype—♂, Aspen Grove, B. C., July 28, 1933, (K. Graham); No. 4477 in the Canadian National Collection, Ottawa.

Paratypes—1 ♂, same locality and collector, July 18, 1933; 3 ♂, Shingle Cr. road, Keremeos, B. C., July 6, 10, 1936, (A. N. Gartrell).

The wing-color varies from grayish-buff to rather bright ochre-buff. The species belongs in the *fuscata-frigidaria* group according to genitalia, the socii being weakly chitinized, long, and not recurved as contrasted with the members of the *sideraria* group where they are short, strongly chitinized, wide apart and bent downward apically. The genitalia of the present species are very similar to those of *frigidaria*.

Scopula septentrionicola n. sp.

Male. Palpi rough, clothed with long hair ventrally, blackish, with a slight admixture of ochreous scaling. Antennae rather lengthily ciliate and fasciculate. Head blackish with sprinkling of ochreous scales. Thorax and abdomen (as far as can be told) somewhat similar but rather paler. Hind legs with the tibiae slender, not laterally compressed, without hair-pencil, and with well developed pair of terminal spurs. Wings deep smoky with obscure maculation, the most prominent feature on primaries being a strongly dentate postmedian line, running rather rigidly obliquely from costa near apex to inner margin before tornus; this is continued on secondaries as a curved line, also somewhat dentate. A small dark discal dot on all wings. In one specimen (paratype) indications of a dark subterminal band are visible on both wings. A dark broken terminal line. Fringes concolorous. Beneath much paler with the maculation of upper side repeated.

Female. Much paler than the male, the wings being whitish with a considerable smoky sprinkling. Maculation of both wings much better defined, the postmedian and s. t. lines being very strong; there are also indications of a dark antemedian line on inner half of primaries and of a faint median shade just exterior to discal dot and more or less parallel to postmedian line on both wings. Beneath quite pale, with the strongly dentate postmedian line very noticeable. Hind tibiae normal with two pairs of spurs.

Holotype—♂, Nation Riv. Yukon Terr. Lat. 65°, 30', long. 141°, July 29, 1912, (D. D. Cairnes). No. 4478 in the Canadian National Collection, Ottawa.

Allotype—♀, White Riv. Dist. Yukon Terr. Lat. 61°, 55', long. 141°, July 16, 1913, (D. D. Cairnes).

Paratype—1 ♂, (abdomen missing), same data as allotype; 1 ♂, Wollaston Land, summer, 1915, (Can. Arct. Exp.).

The material is in very poor condition and had it not been for the good structural characters and the distinctive male genitalia, I should have hesitated to describe it. The genitalia are close to those of *frigidaria* but the sacculus is much stronger and drawn out evenly into a long, sharp point whereas in *frigidaria* there is a distinct shoulder half way between base and apex; the valvulae in the present species are also longer and stronger. The plate of the eighth segment is broader and shorter than in *frigidaria* and the cerata are minute, being even smaller than in this species. At one time there was some doubt in my mind as to whether the name *arcticaria* Wlk. might be applied to the species but correspondence with Mr. L. B. Prout elicited the statement that Walker's type was lost and that it would appear best to let the name stand, under the circumstances, as a synonym of *frigidaria*.

Scopula subfuscata Tayl.

The species was based (1906, Can. Ent. XXXVIII, 402) on specimens from Goldstream, Vanc. Is., B. C., (the holo and allotypes), Victoria and Vernon,

B. C. It might be well for the present to limit the name to the species occurring on Vancouver Island. Mr. Gates Clarke of the U. S. National Museum has kindly made a slide of the genitalia of the holotype (ex Barnes Collection) and compared it with material I submitted, including a Goldstream specimen and several specimens from the interior of British Columbia (Penticton) and from Waterton, Alta. My Goldstream specimen was found to agree as regards genitalia with that of the type but the other specimens showed certain differences, principally in the greater length in the cerata of the abdominal plate of the eighth segment and were referred by Mr. Clarke to *quaesitata* Hlst. according to specimens so named at Washington.

With a long series before me from various localities in the interior of British Columbia, largely from the Penticton-Summerland region, I should hesitate to separate these from *subfuscata* on superficial characters of color and maculation. In structural characters of the male hind-tibia there is considerable variation in the series; terminal spurs may be well-developed, greatly reduced or entirely absent; the tibia is laterally flattened and broadened out but there seems no trace of an *inner hair-pencil* such as is found in *inductata* Gn.; there is, however, a small tuft of *short* hair arising from the knee and on rare occasions a *weak hair-pencil,* consisting of a few long hairs, has a similar point of origin. The same variability is found in our series from Alberta. In genitalic slides made from a number of specimens the cerata of the eighth abdominal plate have shown no very marked variation; they have been consistently longer and narrower, especially on the left side, than those of *subfuscata.* Whether this character is of specific value or not I cannot say at present as my series of the typical *subfuscata* is limited to two males from Goldstream and Victoria respectively. I would note, however, that both these males, besides agreeing in the size of the cerata, show a distinct inner hair-pencil on the hind tibia, arising from behind the knee; this is in addition to the small outer pencil from the knee proper. Neither shows any sign of terminal spurs. Hulst's type of *quaesitata,* a single male from Colorado which I presume is in his collection at New Brunswick, N. J., will have to be carefully studied before this name can be applied with certainty; in the meantime I am following the Washington authorities in the use of this name for our specimens from the interior of British Columbia and Alberta. *Luteolata* Hlst. also belongs in this complex and is closely allied but differs in the longer antennal ciliations, the less compressed hind-tibia and the entire lack of hair-pencil. It is larger and probably more southerly in its habitat; a specimen agreeing with the type was kindly donated by the United States Museum authorities; it was taken years ago by myself at Silverton, Colo. when I was curator of the Barnes Collection.

LARENTIINAE

Carsia paludata var. **columbiatà** var. nov.

A distinct race of *paludata* occurs in the mountains of British Columbia and adjacent regions of Alberta at higher altitudes. It is characterized by its considerably larger size and paler ground color; the maculation is well-defined; the central portion of the median area containing the discal dot is pale grey, bordered on each side by broad brown bands; the postmedian line is in most cases distinctly bordered outwardly by a white line and there is a varying amount of ruddy subapical shading. This race seems closest to the Palaearctic variety *imbutata* Hbn. Expanse, ♂ 25 mm.; ♀ 23 mm.

Holotype—♂, Mt. Apex, Hedley, B. C., (6-7,000 ft.), Aug. 21, 1933, (A. N. Gartrell); No. 4479 in the Canadian National Collection, Ottawa.

Allotype—♀, same locality and collector, July 26, 1934.

Paratypes—42 ♂, same data as holotype, July 21, 22; 2 ♀, same locality, Aug. 4, 1931; Aug. 12, 1934.

Genus **Dysstroma** Hbn.

I have already had occasion (1927, Can. Ent., LIX, p. 240) to comment on the difficult *hersiliata-formosa* group, and on a recent visit to Washington, after a comparison of British Columbian material with Taylor's very worn female type of *boreata,* I was confirmed in my opinion that *boreata* was best listed as a race of *formosa* Hlst.

Typical *hersiliata* Gn. has a *broad orange antemedian band* with the edges somewhat paler and a small pointed wedge of the orange color of the subterminal costal area extending into the cell towards the discal spot; the median band is dark purplish-grey; it is eastern in distribution. *Cervinifascia* Wlk., of which I have a photograph of the type before me, has the median area, except at costa, a *rather light brown,* this color extending over to the outer half of the antemedian band; it has the same tooth-like indentation opposite the discal spot and the inner half of the brown antemedian band shows a distinct upright black bar; it is apparently rather northern in distribution as we have it from Charlton and Biscotasing, Ont. and Mt. Lyall, Gaspe Co., Que.

Mirandata Tayl. is very similar to the preceding but the orange-brown antemedian band is *without the black bar,* the color being much darker than that of *hersiliata;* we have it from the same localities as *cervinifascia.*

Occidentata Tayl. with its so-called form *mutata* Tayl. has the same *broad orange antemedian band* as is found in *hersiliata* but this band is much more sharply angled below costa; the general appearance of the remainder of wing is somewhat paler. My material is too scanty to allow of any comment on its relationships other than that it definitely belongs in this group. It occurs on Vancouver Is. B. C. and the adjacent Pacific coast.

Formosa Hlst. and especially its race *boreata* Tayl. shows as a rule only traces of orange-brown in the antemedian band and subapically; it further has the distinct black upright bar beyond the basal area and lacks generally the sharp indentation of the postmedian line opposite the discal spot; at times there are indications of this tooth but never so pronounced as in *hersiliata.* The forewings appear to be rather more elongate than in *hersiliata* and the hindwings darker. Form *admiranda* McD. is the form with brown median area instead of the normal purple-black color. The distribution is western.

Such genitalic slides as I have made from males belonging to the various forms above-mentioned run very close to each other; the character which is generally considered of most value in specific differentiation, *viz.* the size and shape of the bunch of spines in the aedeagus, is difficult to use in the present cases, as in all the forms it is very similar, consisting of a compact, chunky bunch of cornuti, situated near the apex of the aedeagus. Slight differences as to width and length of this spine-bunch have been noted but, until a large number of slides have been made, it is impossible to say whether such differences are of specific value or merely due to individual variation or a somewhat different position of the aedeagus on the slide.

Amongst our material are several forms which do not fall under any of the above-mentioned names and I believe that, pending a thorough study of the group, it might be well to call attention to them by giving them names as follows.

Dysstroma hersiliata var. **manitoba** var. nov.

Differs from typical *hersiliata* from Ontario and Quebec in the narrower width of the orange antemedian band which is only half as wide as that of the typical form. The outer margin of the dark basal area is as in *hersiliata,* being nearly upright with a slight inward bend at costa; the tooth-like indentation of the outer margin of the median area is present. Subterminal and terminal areas as in *hersiliata.* On the underside of hindwings distinct indication of subterminal dark blotches. Expanse 22-25 mm.

Holotype—♂, Aweme, Man., July 1, 1921, (N. Criddle); No. 4480 in the Canadian National Collection, Ottawa.

Allotype—♀, same locality, July 8, 1921.

Paratypes—5 ♂, same locality, June 28, July 1, 2, 1921, June 23, 1922; 1 ♂, Indian Head, Sask., July 8, 1924, (J. J. de Gryse); 1 ♂, Calgary, Alta., July 25, 1903, (F. H. Wolley-Dod); 1 ♀, Calgary, Alta., July 24, 1909, (Dod); 1 ♀, Nordegg, Alta., July 27, 1921, (J. McDunnough).

A form of this race occurs in which the orange of the antemedian band and subterminal area below costa is replaced by grey and the blackish upright bar on inner portion of antemedian band is present. For this form I propose the name INFUMATA form nov.

Holotype—♂, Aweme, Man., June 28, 1921, (N. Criddle); No. 4481 in the Canadian National Collection, Ottawa.

Paratype—♂, same locality, July 12, 1930, (J. B. Wallis).

There are also two very similar specimens from Oliver, B. C. May 23, 1934 (A. N. Gartrell) which I incline to place here rather than with *formosa* v. *boreata* on account of the smaller size, chunkier forewings and paler colored hindwings as well as the much earlier date of capture.

D. formosa boreata f. **gilvifasciata** form nov.

Differs from typical *boreata* in the presence of a broad antemdian band of orange, much as in *hersiliata;* the outer margin of this band shows a decided outward angulation on the cubital vein and the outer margin of the dark median area is as in the typical form. Subterminal area with no orange brown shades. Expanse 26 mm.

Holotype—♂, Shingle Cr. road, Keremeos, B. C., July 15, 1935, (A. N. Gartrell); No. 4513 in the Canadian National Collection.

The form seems a rather rare one, the specimen being taken along with a number of typical *boreata.*

THE GENUS ILYBIUS ER. IN NORTH AMERICA (COLEOPTERA, DYTISCIDAE)

BY J. B. WALLIS
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In spite of Mr. H. C. Fall's paper on *Ilybius* in the "Entomological News", XXXVIII, 1927, much confusion as to the correct identification of species in that genus is still apparent. Nor is this to be wondered at. One species frequently superficially resembles another so closely that only careful discrimination will make certain what is in hand. Further, to my knowledge, no key by which females can be determined has been devised. This latter deficiency I have endeavoured to remedy.

Our species are all black, sometimes more or less metallic, usually with two pairs of yellow elytral spots. Some species have the elytral margins reddish, and the labrum and appendages in all are in whole or part reddish.

Of the species recognized in Mr. Fall's paper, I have seen neither *suffusus* nor *inversus,* nor have I seen any American specimens of *ater.*

KEY TO THE NORTH AMERICAN (NORTH OF MEXICO) SPECIES OF ILYBIUS ER.

MALES

Posterior tarsal joints margined externally above.....1.
Posterior tarsal joints not margined externally.....7.

1. Posterior tibiae not or scarcely punctate on their lower face except for a group of coarse punctures usually present near the base. Last ventral strongly strigo-rugose and carinate.....*quadrimaculatus* Aube.
Posterior tibiae rather coarsely punctured over at least their longitudinal anterior half. Last ventral of varying types of sculpture.....2.

2. Length 13 mm. and over ..... *ater* De G.
Length not attaining 13 mm ..... 3.
3. Length not over 9.5 mm. Last ventral strongly longitudinally strigose and acutely carinate ..... 4.
Length 10 mm. to 12.5 mm. Last ventral segment of varying types of sculpture ..... 5.
4. Colour greenish, very shining; shorter, 8 mm; elytral reticulation of finer lines and larger meshes; metasternal wings narrower, the least distance between the hind coxal plates and middle coxal cavities about 36% of the width of a coxal plate measured in the same straight line ..... *churchillensis* n. sp.
Colour black, rather dull; longer, 8.5 mm. to 9.5 mm; elytral reticulation of coarser lines and smaller meshes; metasternal wings wider, the least distance between the hind coxae plates and middle coxal cavities about 48% of the width of a coxal plate measured in the same straight line ..... *augustior* Gyll.
5. Last ventral segment without a carina but coarsely closely longitudinally strigose apically especially at sides ..... *subaeneus* Er.
Last ventral segment with a short apical carina, not particularly strigose at sides ..... 6.
6. Elytral reticulation rather large, the engraved lines fine, finer than in *subaeneus* and with many open cells, that is, cells in which an end of the enclosing engraved line is free. Less convex, more parallel ..... *pleuriticus* Lec.
Elytral reticulation smaller, the engraved lines coarser than in *subaeneus*. More convex, less parallel ..... *inversus* Sharp.
7. Length rarely, if ever, over 9 mm.
Last ventral segment with an apical carina ..... *ignarus* Lec.
Last ventral segment without a carina, smooth and shining at middle ..... *discedens* Sharp.
Length 9.5 mm. to 11.5 mm ..... 8.
8. Distance between hind coxal plates and middle coxae unusually narrow, less than one-fifth the longitudinal width of a coxal plate. Last ventral with an exceedingly short and slight apical carina, visible when viewed obliquely ..... *oblitus* Sharp.
Distance between hind coxal plates and middle coxae greater, more than one-fourth the width of a coxal plate. Last ventral either distinctly, acutely carinate or completely non-carinate ..... 9.
9. Last ventral distinctly and acutely carinate ..... 10.
Last ventral not in the least carinate ..... 11.
10. Length about 9.5 mm. Form rather broadly oval, narrowed before and behind. Inner hind tarsal claw a little longer than claw joint ..... *biguttulus* Germ.
Length about 11 mm. Form more parallel, narrower in proportion to length. Inner hind tarsal claw a little shorter or about as long as claw joint ..... *laramaeus* Lec.
11. Length 9.5 mm. to 10 mm. ..... *incarinatus* Zimm.
Length over 10 mm. ..... 12.
12. Distance between the hind coxal plates and the middle coxae nearly one half the width of a coxal plate ..... *fraterculus* Lec.
Distance between the hind coxal plates and the middle coxae not more than one-third the width of a coxal plate ..... 13.
13. Head almost entirely reddish, sometimes infuscate basally; pronotal and elytral margins, epipleurae, entire underside of pronotum and all appendages reddish. Anterior elytral spot usually exceptionally long

.....*denikei* Wallis.

Head dark throughout or with the anterior portion piceous red. Antennae palpi and epipleurae reddish, underside of pronotum and legs piceous. (Immature specimens are frequently more reddish). Anterior elytral spot usually short, occasionally moderately long.....*confusus* Aubé

FEMALES

1. Length 13 mm. or over.....*ater* DeG.
   Length not over 12.5 mm.....2.
2. Hind tibiae rather strongly punctured over much of their under surfaces....3.
   Hind tibiae not at all or exceedingly minutely punctulate, except the usual coarse punctures along the anterior margin and sometimes a group of coarse punctures near base.....7.
3. Sculpture very fine. Elytra with margins broadly and irregularly ferruginous, hiding the usual pale spots. ♀ only known.....*suffusus* Cr.
   Sculpture coarser, as usual in the genus. Elytra with margins more narrowly or not at all ferruginous.....4.
4. Length rarely, if ever, over 9.5 mm.....5.
   Length 10 mm. and over.....6.
5. Colour greenish, very shining; shorter, 8 mm.; elytral reticulation of finer lines and larger meshes; metasternal wings narrower.....*churchillensis* n. sp.
   Colour black, rather dull; longer, 8.5 mm. to 9.5 mm.; elytral reticulation of coarser lines and smaller meshes; metasternal wings wider.....*angustior* Gyll.
6. Elytral reticulation relatively finely engraved, larger, and with many open cells, that is, cells of which an end of the enclosing engraved line is free. Apical ventral emargination not at all rugose laterally, narrower and deeper than in *subaeneus*.....*pleuriticus* Lec.
   Elytral reticulation rather coarsely engraved, small and with few open cells. Apical ventral emargination somewhat rugose laterally, wider but shallower than in *pleuriticus*.....*subaeneus* Er.
   Elytral reticulation coarser than in *subaeneus;* surface of elytra more shining than in that species. Apical ventral emargination wider than in *pleuriticus*.....*inversus* Sharp.
7. Length rarely, if ever, over 9 mm.....8.
   Length 9.5 mm. to 11.5 mm.....9.
8. Engraved lines of elytral reticulation rather coarse. Little, if any, evidence of a secondary system of micro-sculpture.....*ignarus* Lec.
   Engraved lines of elytral reticulation very fine for the genus. A very evident system of micro-sculpture is present, this consisting of areolae and very numerous shallow punctules.....*discedens* Sharp.
9. Distance between hind coxal plates and middle coxae less than one-fifth the length of a coxal plate.....*oblitus* Sharp.
   Distance between hind coxal plates and middle coxae more than one-quarter the length of a coxal plate.....10.
10. Length about from 9.5 mm. to 10 mm.....11.
    Length about from 10.5 mm. to 11.5 mm.....12.
11. Reticulation of the elytra over much of the baso-sutural surface of elongate areolae. Hind tarsal claws shorter, the longer one less than the length of the last tarsal joint.....*incarinatus* Zimm.
    Reticulation of the elytra with but few elongate areolae. Hind tarsal claws longer, the longer one evidently as long or longer than the last tarsal joint.....*biguttulus* Germ.
12. Last ventral segment moderately to strongly triangularly emarginate.....13.
    Last ventral segment at most but little emarginate.....14.

13. Last ventral segment moderately emarginate, the medial fold short, feeble, and bluntly, briefly carinate at apex ..... *laramaeus* Lec.
Last ventral segment strongly emarginate, the medial fold rather wide but not very pronounced ..... *fraterculus* Lec.

14. Side margins practically concolourous with remainder of elytra and pronotum. Last ventral segment with very narrow fold, roundly carinate. Distance between hind coxal plates and middle coxae more than one-third the width of a coxal plate ..... *quadrimaculatus* Aubé
Side margins more or less evidently reddish. Last ventral with a moderate fold, rounded above, compressed apically. Distance between hind coxal plates and middle coxae two-sevenths to one-third the width of a coxal plate ..... 15.

15. Head almost entirely reddish, sometimes infuscate basally. Pronotal and elytral margins broadly, epipleurae, pronotum below, and all appendages reddish. Anterior elytral spot generally unusually long. Emargination of last ventral segment evident though feeble .... *denikei* Wallis.
Head dark throughout or with only the anterior portion piceous red. Pronotal and elytral margins more narrowly, antennae, palpi and epipleurae reddish. Pronotum beneath and legs piceous. Last ventral segment almost truncate ..... *confusus* Aubé

The making of a key for this genus has proved a decidedly difficult task, but I hope that with the notes following it will enable students to identify most of their specimens with some certainty. It will at least serve as a point of departure for further study. I may say that the type of elytral reticulation furnishes a very useful character but one that unfortunately is most difficult to put into words.

NOTES ON THE SPECIES GIVEN IN THE ABOVE KEY WITH A DESCRIPTION OF A NEW SPECIES

Ilybius ater De G. I am of the opinion that this European species does not occur in North America. Mr. Fall (op. cit.) states that the only specimen of the species that he has seen from North American is Loconte's type of *ungularis* (=*ater*). Every record of *ater* from this continent that I have been able to run down has proved to be something else. Should any collector have the good fortune to take *ater* in North America, it should be immediately recorded. Leconte's specimen possibly was incorrectly labelled.

Ilybius churchillensis sp. nov.

Holotype, ♂.

Length 8 mm. Width 4.36 mm.

Form rather elongate for the genus, and not as convex as usual when viewed laterally.

Colour evidently greenish. Surface shining.

Reticulation above of rather large meshes but the engraved lines not deep. The yellow elytral lateral spots but little evident, the anterior the more so. Lateral pronotal bead rather narrow.

Hind tarsal joints margined, *hind tibiae* punctate.

Last ventral segment strigose and with an acute median carina.

Metasternal wing rather narrow, the shortest distance between the middle coxae and the coxal plate 36% the width of the latter measured in the same straight line.

Allotype, ♀.

Size, shape, sculpture and colour as in holotype. Last ventral feebly emarginate and with a rather small fold.

Holotype and Allotype, Churchill, Manitoba, 8. VII. 37 (W. J. Brown), in the Canadian National Collection. A ♂ paratype with the same data is, through the kindness of Dr. McDunnough, Chief of the Division of Systematic

Entomology, Ottawa, and of Mr. Brown in mine. To Mr. Brown I owe also thanks for permission to describe the species.

Churchillensis is quite clearly distinct though closely related to *angustior* Gyll.

The following comparative table will show the differences at a glance:

angustior	*churchillensis*
Black, rather dull.	Greenish, shining.
Larger, 8.5 mm. to 9.5 mm.	Smaller, 8 mm.
Meshes of elytral reticulation smaller and engraved lines coarser and deeper.	Meshes of elytral reticulation larger, engraved lines finer and shallower.
Lateral pronotal bead wider.	Lateral pronotal bead narrower.
Metasternal wings wider, their least width about 48% of the width of a coxal plate measured in the same straight line.	Metasternal wings narrower, their least width about 36% of the width of a coxal plate measured in the same straight line.
♀ ventral emargination with a large fold.	♀ ventral emargination with rather a small fold.

I am unable to associate *churchillensis* with any European species. The males of *churchillensis* and of *angustior* are perfectly defined by small size, margined hind tarsal joints, punctured hind tibiae, and carinate and strigose apical ventral segments. The table above should serve for separation of the two.

Ilybius angustior Gyll. Widely distributed and abundant throughout its range.

Ilybius pleuriticus Lec., *Ilybius subaeneus* Er., *Ilybius inversus* Sharp. Mr. Fall compared a co-type of *inversus* with the type of *pleuriticus* and said: ".....am more than doubtful of its specific validity" (North American Species of Ilybius, p. 282). As, however, Mr. Fall does not definitely announce that synonymy, the following might be considered.

Dr. Sharp knew *subaeneus* and *pleuriticus* and yet described *inversus* without misgivings. He had but one male and that with its hind feet "quite gone", so that it is possible that his specimen does not belong to the group with margined hind tarsal joints. He differentiates it from *pleuriticus* by its more convex, less parallel form, and his measurements uphold his statement. He says also that the reticulation of its upper surface is different from that of *pleuriticus* and a little later says that its reticulation is *coarser* than is that of *subaeneus*, which, since that in *subaeneus* is coarser than that in *pleuriticus*, would make the reticulation of *inversus* considerably coarser than in *pleuriticus*. Finally Dr. Sharp says that *inversus* may be distinguished from *subaeneus* by being more shining and by having the outer portion of the metasternal wing more slender.

On the whole, therefore, it seems to me to be wise to withhold final judgment until specimens of *pleuriticus* and *subaeneus* have been compared with the type, a male, as it is not impossible that the co-type, a female, seen by Mr. Fall is not conspecific.

Ilybius suffusus Cr. Another species that I have not seen. The original description is:

"Closely resembling the two preceding (i. e., *ungularis* Lec. and *pleuriticus* Lec.) but more allied to *I. pleuriticus* by the less coarsely punctate tibiae; colour brassy, sculpture very fine, the whole margin broadly and irregularly ferruginous hiding the usual pale spots. L. .44 inch. Indian Territory."

Dr. Sharp suggests that it may be near the European *fuliginosus* and

meridionalis. Mr. Fall had not seen the species but Mr. Charles Liebeck who was kind enough to study for me the material in the Academy of Natural Sciences at Philadelphia, said, ".....the female in the Horn collection, evidently Crotch's type from Indian Territory, shows this to be an interesting species if a series proves the marginal markings of elytra constant; it is as broadly, irregularly marked as *Trepisternus striolatus* from the southern states. "(C. L. in litt. 1. V. 1922).

If further specimens are taken, the brassy colour, the widely ferruginous margins, the very fine sculpture and punctate hind tibiae should make identification fairly certain. As the female only is known it is quite possible that the species should be associated with the group not having margined hind tarsi in the male. Here possibility of confusion might arise with exceptionally reddish examples of *denikei,* but that species is not brassy, is not very finely sculptured and has not punctured hind tibiae.

Ilybius quadrimaculatus Aubé. The males of this species are, of course, easy to identify, the combination of externally margined tarsi, practically non-punctate tibiae, and the acutely carinate last ventral segment, is definitive.

The females may readily be confused with females of the non-punctate tibiae group, especially *laramaeus, fraterculus, denikei* and *confusus. Laramaeus* and *fraterculus* have their last ventral segments more deeply emarginate than has *quadrimaculatus. Denikei* is always much more reddish, while *confusus* is not only reddish along the margins but its ventral emargination is practically obsolescent.

Ilybius ignarus Lec., *Ilybius discedens* Sharp. These two species together with *angustior* and *churchillensis* can be separated from all our others by their relatively small size, not over 9.5 mm. *Angustior* and *churchillensis* belong in the group with punctate hind tibiae. *Discedens* in both sexes can be determined by its sculpture, much like that of *Agabus confertus,* while the sculpture of *ignarus* is typically that of an *Ilybius.*

Ilybius oblitus Sharp. Mr. Fall includes this species in his non-carinate ventral segment group. There is, however, an extremly short, inconspicuous carina at the apex, visible clearly enough when looked at under high power and from the proper angle. The very narrow metasternal wing separates both sexes of *oblitus* from all our other species of comparable size. It is a point of interest that Dr. Sharp's type was 10.5 mm. long. This is about the maximum length, the average being well below 10 mm.

Ilybius biguttulus Germ., *Ilybius laramaeus* Lec. Mr. Fall sinks *laramaeus* as being of doubtful validity. He says, "The type is slightly smaller and narrower and with the sides a little less evenly rounded than in *biguttulus* and the sculpture of the last ventral (♂) is a little more pronounced, though identical in character." (North American Species of *Ilybius,* p. 283). The type locality is Ft. Laramie.

Some years ago, but after the publication of Mr. Fall's paper, Mr. Liebeck kindly lent me a pair of *Ilybius* from Colorado Springs. These had been submitted to Mr. Fall and returned by him as *laramaeus* with which identification Mr. Liebeck agreed. These specimens agree quite well with Leconte's description but are a little larger, 11 mm. against .37 to .41 of an inch in length. My opinion at that time was that this pair represented a species distinct from *biguttulus* and that opinion has been confirmed as I have seen a ♂ from White Rocks, Colorado (W. C. Yeager), and several of each sex from Pueblo, Colorado (F. K. Smith), which all agree with Mr. Liebeck's pair.

Their form is more parallel and their length greater than in *biguttulus.* The posterior protarsal claw of the male is rather deeply sinuate and when seen from above is evidently thickened basally. This is scarcely evident in *biguttulus.* The hind tarsal claws also differ a little, in *laramaeus* being almost

straight beneath, scarcely visibly deflected at tips. the inner about as long or a trifle longer than the claw joint. Those in *biguttulus* are a little more curved, the tips more deflected and are a little longer than the claw joint. Also, the apical ventral carina is longer in *laramaeus*, and the lateral strigosities near the margin are stronger than in *biguttulus*. The females resemble each other very closely except that *laramaeus* is larger and more parallel. Also the apical margin of the last ventral in *laramaeus* is apparently always more evidently and coarsely punctured than in *biguttulus*, and its plica is a little longer, but so narrow and laterally compressed as to be bluntly carinate while that in *biguttulus* is short, rather narrow but well rounded.

The localities in Colorado seem to be near enough to the type locality to make the identity of the Colorado specimens with the Wyoming type reasonable, and for the present it seems to me the better course to consider these Colorado specimens to be *laramaeus*.

Ilybius incarinatus Zimm. As the description in "Neuer Beitrag zur Kenntnis der Schwimmkäfer" in Wiener Entomologische Zeitung, 44 Band, 3 u. 4 Heft (15 Februar 1928), may not be available to all American students I give it here.

"9 ½–10 mm. In Grösse und Form dem *I. biguttulus* Germ. ausserordentlich ähnlich. Die männlichen Hintertarsen wie bei letzterem an der Aussenkante nicht gerandet. Die Flügeldecken gleichfalls mit zwei deutlichen rotgelben Fleckchen, von denen das eine, längliche, hinter der Mitte neben dem Seitenrand, das andere, rundliche, vor der Spitze steht, im allegemeinen aber dunkler schwarz, ohne Erzglanz.

"Wesentlich verschieden ist das ♂ der neuen Art von *I. biguttulus* durch das letzte Hinterleibssegment, das weder Längskiel noch Längsrunzeln zeigt; ausserdem ist die Hintere Hinterklaue länger und stumpfer, an der Spitze kaum gebogen, die Metasternalflügel etwas breiter und der Prosternalfortsatz weniger lang zugespitzt.

"Das ♀ ist von der verglichenen Art nur sehr schwer zu unterscheiden durch die stumpfere äussere Hinterklaue und die dunklere, nicht erzglänzende Farbung. Das letzte Hinterleibssegment ist hinten breit dreieckig ausgeschnitten, der Hinterrand ist in der Mitte leicht beulig aufgetrieben und wird jederseits von einer kurzen, schmalen Querfurche begleitet.

"*I confusus* Aubé, der die gleichen männlichen Geschlectsauszeichnungen trägt, ist grosser als *incarinatus*, 11 ½ mm., die Vorderklauen sind etwas länger als beim letzterem, der Hinterrand des letzten Abdominalsegmentes ist beim ♂ weniger verrundet, fast gerade abgeschnitten und beim ♀ viel tiefer dreieckig ausgeschnitten.

"Nordamerika: Illinois, Glauco. Typen und Cotypen in meiner Sammlung."

The important points in this description appear to be as follows: The insect is extraordinarily like *biguttulus* in size and form; its colour is in general black without metallic sheen; the last ventral ♂ is without carina or longitudinal strigosities. The female is extremely like allied species, but its outer hind claw is stouter and its colour is darker and non-metallic, its last ventral is broadly triangularly emarginate, with a broad plica, on each side of which is a short, small, oblique depression.

It will be noticed that Dr. Zimmermann speaks of *confusus* ♀ as having a deeply triangularly incised last abdominal segment. That segment in *confusus* is really extremely slighly emarginate, almost truncate, with a rather broad plica compressed apically into almost a point, on each side of which is a feeble evenly curved depression. It seems probable, therefore, that Dr. Zimmermann had *fraterculus* ♀, not *confusus* ♀, before him, *fraterculus* having a deeply triangularly incised last abdominal segment, an easily understandable error as

fraterculus was, until the publication of Fall's paper, universally indentified as *confusus.*

The males of *incarinatus* cannot be mistaken for *biguttulus* as their apical ventral segment is entirely devoid of a carina.

The elytral reticulation of *incarinatus,* as shown by a series of more than a dozen including a co-type, consists, baso-suturally at least, of elongate areolae, thus differing materially from the reticulation of *biguttulus* which consists of rather small, more or less rounded areolae.

Ilybius fraterculus Lec., *Ilybius confusus* Aubé, *Ilybius denikei* Wallis. These three species with *incarinatus,* characterized by practically smooth hind tibiae, males with hind tarsal joints not margined externally and with non-carinate last ventral segments, may be thus differentiated.

incarinatus. Smaller, 9.5—10 mm. Black or very dark pitchy red, not aeneous. Elytral areolae baso-suturally longitudinal and narrowly elongate. Elytral spots usually distinct. Emargination of last ventral segment of ♀ broad and shallow.

fraterculus. Larger, 10.5 to 11.5 mm. Black, aeneous, margins not or feebly reddish. Elytral areolae more or less elongate baso-suturally but less regularly longitudinally so than in *incarinatus.* Elytral spots small, frequently one pair or both pairs lacking or nearly so. Distance between coxal plates and middle coxae unusually great, the least width of a metasternal wing being about 42% of the length of a coxal plate measured in the same straight line. Ventral emargination of the ♀ deep, triangular.

denikei. Larger, 10—10.71 mm. Black, slightly aeneous, but markedly reddish. Under side of pronotum reddish. Ventral emargination of ♀ quite broadly though slightly emarginate, with a narrow, short compressed plica. Width of metasternal wing about 30.5% the length of a coxal plate.

confusus. Larger, 11.5 mm. Black, somewhat aeneous with reddish margins but not nearly as reddish as *denikei.* Metasternal wing about 32.5% of a coxal plate. Ventral emargination of ♀ obsolete, the apex of the segment almost truncate, the plica quite long and rather broad except apically where it is compressed almost to a point.

NOTES ON SOME TROPICAL DRAGONFLIES

BY FRANCIS CECIL WHITEHOUSE
Vancouver, B. C.

I spent December to April 1937—'38 at St. John, Virgin Island, W. I., and the same period 1938—'9 at Tahiti, French Oceania. The following paper records the species taken, with some notes as to habits and brief descriptions as to the colour pattern of the live insects. This I hope is justified, for too often the original description is of specimens long dead, when the body colour has faded and that of the eyes completely changed.

ST. JOHN, VIRGIN ISLANDS, W. I.

On an island virtually devoid of fresh water—the inhabitants being dependent upon rainfall—it was surprising to find a representative dragonfly fauna. My collecting ground was chiefly restricted to rocky creek-beds, doubtless flowing in the rainy season, but now reduced to a few nearly stagnant pools. These drainage creeks are known as "guts": respectively Buffrum, Envy and Bass gut; all situated within two miles of Cruz Bay, and of which the last named, with its string of three spring-fed pools, was the most productive. Several species were taken in fields or on roadways near one or other of the guts.

To the native negroes dragonflies are known as "Aunty Nannies", (the darting flight being likened to the good lady threading her needle) and, once my need was known, I was conducted to the guts named.

Protoneura capillaris Rambur. A damselfly of singular appearance: the

abdomen being of needle thinness, balanced by greatly swollen segments 6 and 7. A pair taken *in cop* at Envy gut, December 16th: these being the only ones seen. Their season was presumably over.

Enallagma coecum coecum Hagen. Male: thorax purple and blue. Abdomen segments 1, 2 and 3, also 8 and 9 purple; 4 to 7 metallic black. A short series taken: still flying March 8th, at Bass gut.

Ischnura ramburii Selys. Male: thorax green. Abdomen metallic except segments 8 and 9. Females are of two forms, one like the male, and the other (at least when young) with thorax light brown, all segments of abdomen metallic green. A series of both sexes taken between December 16th and April 2nd.

Orthemis ferruginea Fabr. Males: plum-purple. Females, brown as tenerals, later red-brown. They rest on twigs, brush and tips of long grasses. Females oviposit in chick-weed and algae at edge of pools, but watchfully, and males seeking a seizure are frequently evaded. When mated they disappear for a few moments and return to the water. A long series taken of both sexes.

Perithemis domitia Drury. A very small amber-brown species; wings amber with red stigma. They fly with low, darting flight and rest on sticks protruding from the surface of the water. On December 19th a female was noted ovipositing on the north side of a wet rock in the centre of the pool. She would wipe off five or six eggs in quick succession, then back away and repeat. Five males were taken.

Erythrodiplax umbrata Lin. Males: thorax olive-green. Abdomen olive-green, with dark brown lateral patches, fainter on dorsum. An aged male was blue-black. Appendages light. Wings of males all heavily banded, with hind wings tinted at base. Females—two taken—wings not banded. Only one of this species, a male, was seen at the pools; but both sexes were captured in the "Catch and keep" brush, and over roads. They rest on the bushes.

Lepthemis vesiculosa Fabr. Males and females: green and black with slim abdomen. Face light green, also the thorax. Abdomen segments 8, 9 and 10 black, remainder green and black. Appendages green. Hind wing yellow-brown at base, stigma grey. The insects rest on twigs, grasses and bushes near or over the water. They are excellent flyers. At Bass gut females oviposited in chickweed and algae along the edge of the pools. A series taken between December 17th and April 2nd.

Macrothemis celeno Selys. Males and females: general colour black, with light blue-green spots on sides and dorsum of thorax and twin spots on dorsum of abdomen. Eyes blue. These insects rest on the warm rocks, not on vegetation. At the pools, shares with *Orthemis ferruginea* distinction of being least rare. A good series taken. After copulation oviposits immediately, male hovering by. She washes off eggs in low, straight flight every four or five inches, either in clear water or algae.

Dythemis rufinervis Burm. Male: face, eyes, thorax and abdomen red. Wings red veined, brown at base, particularly the lowers; stigma dark red-brown. Female is browner than the male. A swift flyer and wary: difficult to net. They rest on twigs and grasses at the water. Scarce: there seldom being more than one at the pools on the same day. Observed ovipositing in algae, with the male hovering by.

Tramea abdominalis Rambur. Males: scarlet abdomen, with black spots on dorsum of segments 8, 9 and 10. Face, eyes and thorax dark red. Wings veined reddish, stigma red: an oblong red-brown patch at base of lowers. Ovipositing: the female is seized over the water and they fly in tandem for some time. Sometimes the male releases her while she dips her abdomen but once, only to seize her again, and this may be repeated a number of times. Sometimes he will hover three or four feet over head. Sometimes, again, the male

is not in evidence. Swift flyers: a good series was secured, December 21st to April 2nd.

Pantala flavescens Fabr. Male: face light orange; eyes red above, blue-grey beneath. Thorax (sides) grey-green; abdomen red on dorsum, with a line of black spots, yellow on sides and beneath mottled, white, yellow and black. Wings, costa and stigma red, with light brown patch at tips. Female: face yellow, eyes red-brown. Thorax and abdomen olive-brown, grey below: dorsum, line of black spots. *Flavescens* ranges widely from its water and may be taken in fields and on roadways, but it was not common at St. John.

Pantala hymenea Say. Several of these (the large spot at the base of the hind wings making them conspicuous) were flying with a greater number of *flavescens* in a field near Cruz Bay on January 5th. The sun was blazing hot and I spent an hour in vain trying to capture one. Then the sun was momentarily obscured, and a female settled near me. My only capture.

TAHITI AND MOOREA (FRENCH OCEANIA)

While the Society Islands provide but a short list of dragonflies, the insects are quite numerous as might be expected with an abundance of fresh water rivers, creeks, runways and stagnant pools. The solitary species of Zygoptera is surprising, especially since insects of the sub-order have a high ratio to Anisoptera at Samoa, of approximately the same latitude. The Tahitian name for dragnflies is *piao*: (pronounced *pe-ow*).

Ischnura aurora Brauer. Male:23 mm. Head, above, black with two blue spots, below light green. Abdomen terra cotta, with black area centering on segment 7, and all of 10. Segment 9 all blue and apical third of 8. Female: dark metallic green, light below. Pruinose forms seen. Habitat: all stagnant water and also seen on creeks. Flies throughout the day. Ovipositing frequently observed. Female (alone) settles on weed 10 or 12 mm from the water, and curving her abdomen, stabs eggs into weed stem or algae at surface level: moves on and repeats.

Anax guttatus Burm. Male: length 78 to 87 mm. wingspread to 115 mm. Face light green. Eyes and thorax olive green. Abdomen black with green lateral spots, excepting an area, part segments 2 and 3, light blue. Appendages brown. Legs black. Wings clouded brown, particularly lowers. Stigma, black above, pale grey beneath. Female: (one) length 80 mm., wingspread 115 mm. Very similar to the male (one specimen wings not clouded). Appendages short, broad. Habitat: stagnant runway Papeari district and a dead mouth of the Punaru river. Ovipositing observed a number of times, with no male on the water. She seizes a water weed and sinks her abdomen lower and lower, until segment 2 is level with the surface. This is repeated at distances of a few feet, or she may remain two or three minutes at one place. *Guttatus* is a day flyer, captures being made from 8.30 a. m. to 4.30 p. m. One occasionally seen flying at dusk. Males fly over the water in a leisurely, direct flight and are not difficult to net. Females were scarce, apparently only visiting the water unobtrusively to oviposit. One was noted, seized flying over the water, and the pair departed immediately into the trees.

Anaciaeschna jaspidea Burm. Male: length 62 mm. Wings clouded, stigma brown. Eyes light *blue*. Thorax brown, with wide bands. Abdomen, segment 2 area blue, remainder brown with light spots. Appendages long, slim. Female: length 62 mm. Eyes *green*, otherwise very similar to male. Habitat etc.: *jaspidea* is essentially a dusk flyer, appearing in numbers as the sun sets, and also on the wing before sunrise. Common on the beach Punaauia district and roads Papeari district. Sexes easily distinguishable on the wing by the colour of the eyes.

Tramea limbata Desj. Male: length 54 mm. Wings red veined, with oblong brown patch at the base of lowers. Eyes black-red. Thorax brown,

hairy. Abdomen blood red, with black tip. Legs black. Female: wings clouded, veins black. Abdomen red-brown, black tip. Habitat: stagnant runways and ditches: pool at dead mouth of Punaru river. A day flyer, disappearing by late afternoon. Ovipositing: the female is seized over the water and the pair depart into the trees. On returning they fly low and the female is released to dip her abdomen once, when she is seized again. This is repeated a number of times (see note to like effect respecting *Tramea abdominalis* in above St. John list). Ovipositing is also performed alone and in tandem.

Diplacodes bipunctata Brauer. Male: 30 mm. Face cherry red. Eyes dark red, also thorax and abdomen. Wings clear, with small brown patch at base of lowers, stigma brown. Female: 27 mm. Entirely green-brown, with a light line down dorsum of thorax—more noticeable in tenerals. Beneath pruinose. Habitat: stagnant ditches and pools—old mouth Punaru river. Ovipositing: sometimes the female is alone, but more frequently the pair flying in tandem: when they might easily be mistaken for a pair of ovipositing *Sympetrum vicinum*. This common species is a day flyer at water, but individuals will be observed on vegetation along roads up to dusk.

Tholymis tillarga Fabr. Male:head, thorax and abdomen red. Lower wings brown to nodus, such brown patches being margined broadly with white. Female: body olive-brown. Wings clouded brown. Habitat: fresh water stagnant ditches and pools: old mouth of the Punaru river. Also brackish tidal creeks. At dusk, sea shore. Ovipositing: with male hovering just above, the female poises some three inches over the water, then drops quickly to dip the tip of her abdomen. Frequently she faces back and forth over the same piece of water, depositing the eggs at the same spot. The male, hovering on guard, rushes at all intruders (males of the same species) when they spin around rapidly in a circle parallel to the surface of the water. Whenever males meet they perform in this most unusual manner. *Tillarga* flies early morning, and again late afternoon until dark. At a piece of water, occupied by the day fliers throughout the sunny hours, it will not be seen until they are ready to depart or have actually gone. It then has the pool to itself.

Pantala flavescens Fabr. Brief descriptions given in the St. John list. Habitat: stagnant ditches and pools. Flight: throughout the day, ranging widely from the water; in fact, will be seen everywhere. Ovipositing: the female is seized over the water and the pair rush off in a nuptial flight. Returning, they fly low over the water in tandem, the female dipping the tip of her abdomen every few inches.

Note: the material taken at St. John was divided between the British Museum (Natural History) and the Royal Ontario Museum, Toronto; and that taken at Tahiti was given to the two Institutions mentioned, the United States National Museum, Washington, and the California Academy of Sciences, San Francisco. The St. John specimens were identified by Dr. E. M. Walker of Toronto, and he and Mr. Kimmins of the British Museum (Natural History) identified the Tahitian material.

THE DISTRIBUTION OF THE MORMON CRICKET, ANABRUS SIMPLEX HALDEMAN, IN SASKATCHEWAN

BY L. C. PAUL AND W. B. FOX
Dominion Entomological Laboratory, Saskatoon, Sask.

Within the past few years an increase both in abundance and distribution of the Mormon cricket has occurred in Saskatchewan. This was especially conspicuous in 1938.

The distribution of the Mormon cricket, as based upon records from 1924 to 1938 inclusive, is shown on the accompanying map. During the years from 1924 to 1931, single records were secured for five of the years, all of them being from southern Saskatchewan and, with one exception, in the open prairie region. In 1932 five records were obtained, four of which were from the south-central

portion of the province. The following year, twelve widely distributed records were secured, all but one from the prairie area. Evidence of further increases were observed in 1934. Although fewer records exist for the next three years, those secured show the distribution extending farther into the park belt. The marked increase of the Mormon cricket in 1938 is indicated by a total of thirty-five records. These include the whole prairie area and extend into the park belt almost to the heavily wooded territory.

Only one specimen has been received from beyond the park belt, that being from Tisdale in 1933. This is from an area which originally was heavily wooded but has now been mostly cleared. It is the most northerly record secured, and is about 260 miles north of the International border or just south of latitude fifty-three degress.

It must be recognized that the above records are by no means complete; this is specially true for the earlier years when the data are limited. However, the data are significant of a steady increase in the abundance and distribution of this insect, as observed by entomological officers and as indicated by specimens sent to the laboratory for identification. It is clear that the Mormon cricket has recently appeared in areas where it was not previously known.

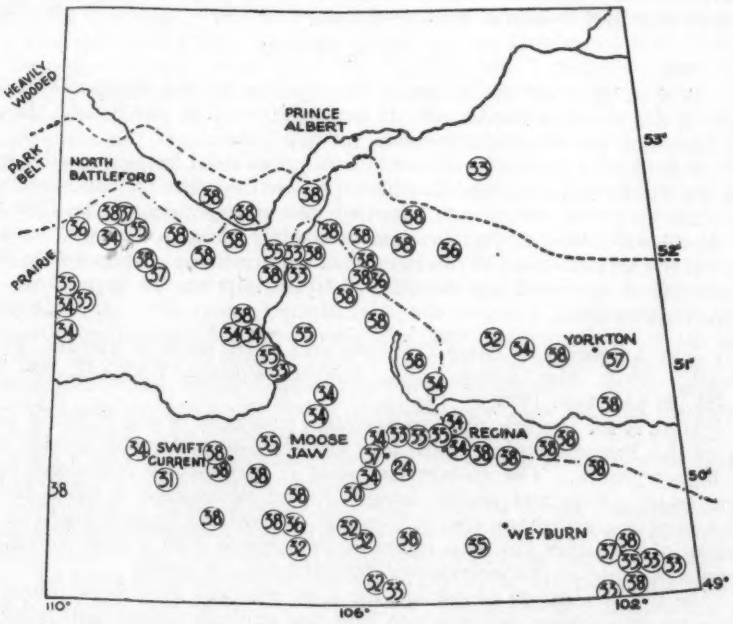

Fig. 1.—Sketch map of Saskatchewan indicating occurrence of Mormon cricket between 1924 and 1938. Figures in circles indicate year and general localities in which specimens were taken.

The distribution of the Mormon cricket is closely correlated with the abundance of grasshoppers which have been a pest over this area since 1931. First appearing in outbreak numbers in southern and central Saskatchewan, the grasshopper infestation extended to the north-west in 1934 and more recently to the north-east, until in 1938 practically the entire agricultural area of the province was infested.

Only in the past season has this cricket been sufficiently abundant to

cause any alarm to farmers, and this principally in portions of southern Saskatchewan. However, over much of the infested area the Mormon cricket is still looked upon as an oddity, there being no confirmed records of damage occurring to crops anywhere in Saskatchewan. In view of the relatively small population of this insect, it is not anticipated that control measures will be necessary in this province in 1939.

RESEARCH NOTE

LAMPRONIA RUBIELLA BJ., AN EUROPEAN RASPBERRY PEST NEW TO NORTH AMERICA.

In May, 1936, an unusual type of insect injury was observed in a cultivated raspberry plantation near Fredericton, N. B. The injury was confined to the buds, many of which died shortly after leafing out, while others showed little or no development. These affected buds were found infested with a small lepidopterous larva. In 1938 reared adult moths were identified by August Busck, Division of Identification, U. S. Bureau of Entomology and Plant Quarantine, as *Lampronia rubiella* Bjerkander. This is the first North American record of this European insect. A paper on the data obtained with attempted control measures is in course of preparation. C. W. B. Maxwell.

BOOK NOTICES

A Catalogue of the Original Descriptions of the *Rhopalocera* Found North of the Mexican Border. Pt. II Satyridae, by C. F. dos Passos. Price 50c. The Cheyenne Mt. Museum, Colorado Springs, Colo.

The second part of this useful little publication has appeared. It deals with the family Satyridae and has been prepared by that well-known entomologist, Mr. C. F. dos Passos. In the main the arrangement of the 1938 Check List has been followed; certain nomenclatorial changes, however, have been made in the specific terms in the interest of strict priority. Some minor changes in the style of type used, notably for synonyms, improve the appearance of the work considerably. J. McDunnough.

The Fulgorina of Barro Colorado and other parts of Panama, by Z. P. Metcalf. (Bull. Mus. Comp. Zool., Harvard College, LXXXII, No. 5, pp. 277-423, 23 pls., Oct. 1938).

Here is for the first time an adequate treatment of the Fulgorid population of the Panama region, with keys and definitions for the species, genera and higher groups. The author has found it necessary to re-evaluate and redefine many genera and higher categories, and an attempt is made to assign to the correct genus many species formerly of doubtful generic position. The question of genotypes has been carefully investigated with a view to stabilizing the nomenclature in this notoriously difficult group of insects.

In the elucidation of species, the male genitalia have been found to be of primary importance, and it is also held that genitalic studies will prove valuable in determining the relationships of higher categories.

As in Dr. Metcalf's former publications on the Fulgorids, the illustrations are copious and well executed. The paper lacks an index. G. S. Walley.

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10

The Canadian Entomologist.

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THE HISTORY OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO AS INTERPRETED BY A LONDONER

BY JOHN D. DETWILER
University of Western Ontario, London

Looking over one's mail is commonly a routine matter but a procedure that must be attended to if routine is to continue. Now and then, however, the unexpected happens and something that "is different" turns up. And so it was when the January number of the Canadian Entomologist, the Commemorative Number, was delivered.

This number is well named. It commemorates the seventy-fifth anniversary of the Entomological Society of Ontario, the Society that pioneered and persisted and that has achieved a record unique in America. Of this Society we may well be proud. But why should this make news. Just this, that the early life of this society was "part and parcel" of the London of years ago.

In order to learn more about this organization, I recently called on an old and very well known London resident, Dr. Solon Woolverton, who, if the Psalmist's expectation of life was correct, is now enjoying his twenty-fifth year of "borrowed time". On prying into the past he told me that in the fall of 1880, fifty-eight years ago, he came to London to set up a practice. On looking about for an office, he was informed by Mr. William Saunders that the room occupied by the Entomological Society would be vacant since they were moving to new quarters. This bit of information gave me pause, sobered me; it made me feel as though scenes long since removed and voices stilled were not so distant when time was bridged by the human voice. Besides it cleared up a difficulty of historic interest. This room, I might add, was not only taken over by Doctor Woolverton but retained for the ensuing fifty years. It was located in the south-east corner on the second floor of what is now the drug establishment of Cairncross and Lawrence. In that upper room with its cheerful south and east exposures, I dare say many a profound discussion took place between the pioneers who made Nature their vocation and established a tradition. And up into that room many a budding entomologist wandered from the side entrance on Clarence Street to have his newly found trophies identified.

One likes to think of those days—the days of great naturalists—when literary men, professional men, and others from the humbler walks of life found common cause in the out-of-doors, and gained wholesome respite from the daily grind. To them Nature was not just something to be stripped of its mysteries, mined so to speak, but a reality to be enjoyed, studied and contemplated.

But I am forgetting the beginning of the story. Perhaps it is because Toronto had a share in it. At any rate, years ago, shortly after the middle of the last century, two young men, one a student at Trinity College, Toronto, and the other a druggist and chemist in London, pursued, each in his own way, the fascinating study of insects. Both of these men achieved outstanding success in their day. The former became the Rev. Dr. Charles J. S. Bethune, F.L.S.,F.R.S.C and the latter Dr. William Saunders, C.M.G., F.R.S.C., F.L.S.—and the father of Dr. W. E. Saunders whom we in London know so well.

Mutual interest attracts and so it was with these two men. In their case, however, a third naturalist, Dr. Henry Croft, Professor of Chemistry in the University of Toronto, became the intermediary. He too was interested in

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insects and at his suggestion Bethune wrote to young Saunders. A warm friendship sprang up, and as they discussed their mutual interests, a desire to extend the "brotherhood" expressed itself in a canvass of all Canadians known to be interested in entomology. This was done by correspondence and the list as published in 1862 was quite instructive as well as interesting because of the vocations indicated. It represented men from very diverse walks of life; geologists, the clergy, teachers, tradesmen, medical men, the army, even a financial director of a railroad, and a few women.

Working on the principle, I presume, that "in unity there is strength" the next ambition of the pioneering trio was to organize. This was accomplished in 1863 at a meeting held in the rooms of the Canadian Institute in Toronto. The newly formed society, The Entomological Society of Canada, met in the Institute's rooms until 1872, when it was decided to move to London, and thus it was that the room on the corner of Clarence and Dundas streets became the official headquarters.

Possibly the name "Entomological Society of Canada" as just used, in place of that of "Ontario" may have aroused some suspicion of error. This is not the case. It expressed a fact, or rather shall I say, an adjustment to a new and unexpected situation, as we shall see. Before going into details, however, it should be understood that the original scope and territorial interests of the Society have never changed. They are still Dominion-wide.

In 1870, the Ontario Department of Agriculture requested the Society to prepare a report on injurious insects. This was done by Messrs. William Saunders, C. J. S. Bethune and E. Baynes Reed (another Londoner) and thus was issued the first Annual Report of the Society. Following this Report, the Government of Ontario gave the Society an annual grant and the Society in its turn became incorporated by Act of the Legislature (1871) as the Entomological Society of Ontario.

This grant of $400.00 was manifestly inadequate for the needs of an ambitious society. But here, as so often since, the insects stepped into the breach. This was well expressed later by Dr. Bethune when he said, "Happily for us the Society's fortunes were made by the advent of the Colorado Potato Beetle," proving once again, I might add, the truth of the old adage about "the ill wind." On the advent of the new pest, the Colorado Potato Beetle, the Government once again turned to the Society and requested a report. This was prepared by Messrs. Saunders and Reed and this is where a "fortune" was made for the grant was raised to a thousand dollars per annum.

Organizations, however, are but a means to an end and to this our Society was no exception. Through it a few men of singular ability and public spirit were enabled to serve a larger purpose. Among such men who pioneered in London none was more outstanding than Doctor Saunders. In fact, he was the moving spirit. At the age of twelve he came to Canada from Devonshire, and after obtaining a technical training in chemistry, became first a retail and later a wholesale druggist in this city. Throughout his twenty-five years in business here he maintained an active interest in entomology, botany and horticulture. As an instance of his practical devotion to his avocation, we should not fail to mention that he engaged in planting and caring for a farm of seventy-five acres on which he intended to make friut the main crop, and further, that on finding this project too great a drain, abandoned it for a smaller farm with a view to using it entirely for experimental purposes.

But associated with Doctor Saunders in the work of the Society in London was another Devonshire man, Mr. J. M. Denton, a tailor by trade. He not only built up a fine collection of insects, including exotic forms, but became an extension lecturer in his own right by giving public addresses on the subject of in-

sects. These lectures he illustrated from a large case of insects he carried about with him. This gentleman, we should not fail to mention, was a great friend of Sir John Carling, a coincidence that made history for, when Sir John as Minister of Agriculture, sought a man to organize an experimental farm system of the Dominion Department of Agriculture, he was informed by Mr. Denton that none better than Mr. Saunders could be found. Doctor Saunders thus became the Director of the Dominion Experimental Farms, was removed to Ottawa and was lost to a large extent to London.

But I should like to refer again to the budding entomologists and in this connection quote from Professor A. W. Baker's "Short History of the Entomological Society of Ontario" given on the occasion of the seventy-fifth anniversary. "The rooms of the Society were open to youngsters, as well as to adults, who were interested in insects. I have personal recollections of many pleasant hours spent in the Society's headquarters in the Y. M. C. A. and the Public Library Buildings in London. Of the group of boys who were welcomed there at the beginning of this century, it is interesting to record that W. R. Thompson of the Parasite Laboratory at Farnham Royal (England), A. C. Baker of the U. S. Bureau of Entomology and Plant Quarantine and myself have kept up active work in entomology."

In this connection, and as an illustration, I should like to mention another of the young entomologists, one of the group that did not make the study a profession. This was Mr. T. H. Hill, who as a boy in his 'teens found his way into the room on the corner of Clarence and Dundas Streets and who, in the pursuit of his hobby, collected twenty cases of local insects. But his collection, he informed me, was by no means the best. While reminiscing on the past, he smiled as he recalled that those twenty cases cost him twenty dollars empty, and that, before leaving for Africa some years later he sold them for twenty including the contents.

Before proceeding further I must retrace my steps and explain that after moving from the corner of Clarence and Dundas streets, the Society's next headquarters were in Victoria Hall, 394 Clarence Street, now the divisional headquarters of the Salvation Army. Here the Society remained until 1896, a goodly number of years, when more commodious quarters were obtained in the Y. M. C. A. Building, 429 Wellington Street. A spirit of uneasiness now apparently settled on the Society, for in 1904 another moving took place, this time to the Public Library Building on Queen's Avenue. Two years later a final flight occurred, one that carried it beyond London and on to the Ontario College, at Guelph, a very unfortunate move for London, for with it went not only a fine collection of insects but also a very valuable library.

But the removal of the insect collection and the library, or even that of the official headquarters, in effect the Society, was not London's *real* loss. Insects and books are material things and an organization a framework. No, the fact that the removal must have been symptomatic of a situation was the tragedy. But all was not lost. In the heyday of the Society, when meetings were held once a month, meetings that attracted men from beyond Toronto and to which on one memorable occasion, as Doctor Dearness tells us in his reminiscences, William Osler, afterwards the celebrated Sir William Osler, came as a boy, a division of the Society was decided upon and carried out. Three new groups, or shall I say clubs, emerged, one interested in birds, another in botany and a third in geology. Each had its particular followers but some members retained a general interest. Of these groups none survives here but the bird club, now known as the McIlwraith Bird Club. It continued not because of the organization but because of the sustained interest of a few moving spirits, chief among which has been Dr. W. E. Saunders.

In its permanent quarters at Guelph, the Entomological Society of Ontario has become an institution. Once a year the members, now largely professional entomologists, meet in convention, present a constructive program and attract rather wide attention. These yearly transactions and proceedings are published as Annual Reports. Besides this The Society still publishes its monthly periodical, The Canadian Entomologist, first published in 1868. The Society thus carries the record of having maintained unbroken an official publication for a longer period than any other similar society in America.

Truly the Commemorative Number of the Seventy-fifth Anniversary of the Entomological Society of Ontario has performed a service. In this record, though all too brief, there also appears "Greetings" from the Entomologists of the United States", felicitations that are not only truly expressive of the past but an earnest of the days to come. And finally we must not fail to mention the reminiscences of Dr. W. E. Saunders and Dr. John Dearness, two outstanding members of the second generation of the Society and now the "old guard", whose kindly recollections inspire us as they gather up the light of other days.

THE PLECOPTERA OF WESTERN MONTANA

BY GORDON B. CASTLE,
Montana State University, Missoula, Mont.

The streams and lakes of western Montana offer a variety of habitats for species of aquatic insects but heretofore extensive collection and study of these forms has not been undertaken. During the past two years collections of both nymphs and adults have been made on several streams. The Plecoptera in these collections include the undescribed nymphs of *Nemoura cinctipes* Banks and several species which have not been reported for Montana.

The paper includes the description of the nymph of *Nemoura cinctipes* Banks and reports the known records of Plecoptera in Montana. The author is indebted to the late Dr. P. W. Claassen for checking the identification of certain nymphs and to Dr. T. H. Frison for similar aid with regard to certain adults.

Nemoura cinctipes Banks.

Description of Nymph.

Length of body up to 7 mm.; cerci up to 4 mm.; antennae up to 4 mm. General color yellowish brown; abdominal segments and wing pads darker brown in mature nymphs.

Head width	1.2 mm.
Pronotal width	1.45 mm.
Pronotal length	1.04 mm.
Distance ocellus to eye	.19 mm.
Distance between posterior ocelli	.35 mm.
Antennae of about	60 segments

Pronotum with angles rounded; surface smooth; margin fringed with blunt hairs; hairs on lateral edge and angles longer than those on front and hind margins. *Mesonotum* with blunt spinules on antero-lateral angles. *Hind wing pads* wider than front pair and diverging at an angle of about 35 degrees from the long axis of the body.

Legs stout; femora of forelegs with a row of long hairs obliquely placed in distal third and joining a group of shorter hairs on the posterior surface of the proximal two thirds of the femur. Femur of second leg with a row of long hairs encircling it in the distal third with a few hairs on the anterior border of the proximal two thirds. Femur of third leg with a row of stout hairs forming a semicircle on the anterior border in the distal half.

Cerci of about 22 segments, each segment with a terminal circlet of hairs.

Gills. Four groups in the cervical region just anterior to the prosternum. Bases of the two groups on each side closely approximate. Two outer groups

of gills of four filaments each; the three inner filaments of approximately the same length, the outer filament about one-fourth as long as other. The two inner groups of gills of four filaments each, the three inner ones of about the same length, the outer filament less than one-fourth as long as the others (fig. 1).

Mouth parts. Right mandible with four teeth; two anterior teeth set close together and larger than posterior teeth. Last tooth small and somewhat blunt. *Maxillae* stout; lacinia with two terminal teeth, subsidiary teeth at base of terminal teeth; fringe of small hairs on inner margin. Galea reaches to end of lacinia; palp of five segments, basal segments short. *Labium* about as long as wide; anterior margin straight.

Locality. Rattlesnake Creek, Missoula, Montana.

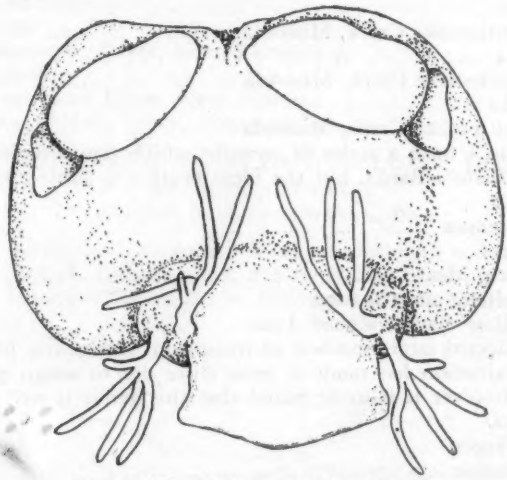

Fig. 1. Gills of *Nemoura cinctipes* Banks.

Although rearing experiments have not been conducted to prove the relationship of this nymph to the adult of *N. cinctipes,* the following observations point to this relationship: In collecting weekly over a period of nine months in Rattlesnake Creek the only nymph of this genus taken was this one; likewise, the only adult *Nemoura* collected on the stream belonged to this species; and in newly emerged adults there are found remnants of gills similar to those described in this nymph. For these reasons this nymph is assigned to *Nemoura cinctipes* Banks.

The following table presents the known records of Plecoptera in Montana. In the table NC refers to Needham and Claassen's "Plecoptera of North America" (1925), C to Claassen's "Plecoptera Nymphs of North America" (1931), and GBC to the author's collections. All localities are in Montana. N indicates nymphal stages, A adult stages.

Since considerable difficulty is encountered in separating certain species on the basis of nymphal characters, the identification of nymphs in some instances is to be regarded as tentative. Rearing experiments have not been conducted and therefore these forms are assigned to their respective species on the basis of nymphal characters alone.

PTERONARCIDAE

Pteronarcys californica Newport

N.	Bozeman	C
N.	Rock Creek	*GBC*

A. and N. Blackfoot River Near McNamara's landing ..... GBC

Pteronarcella badia Hagen

A. Bozeman ..... NC
A. Bridger Mountains ..... NC
N. Blackfoot River near McNamara's landing ..... GBC

PERLIDAE

Perla languida Needham and Claassen

A. Troy ..... NC
A. Beaver Creek ..... NC

P. aestivalis Needham and Claassen

N. Rattlesnake Creek, Missoula ..... GBC

P. capitata Pictet

N. Rattlesnake Creek, Missoula ..... GBC

P. expansa Banks

N. Rattlesnake Creek, Missoula ..... GBC

P. verticalis Banks

N. Rattlesnake Creek, Missoula ..... GBC

In addition I have a series of nymphs which tentative identification indicates to be *P. hastata* Banks, but the identification is subject to confirmation.

Alloperla fidelis

A. Bozeman ..... NC

A. pallidula Banks

A. Crazy Mts. ..... NC

A. spatulata Needham and Claassen

A. Yellow Bay, Flathead Lake ..... GBC

I have collected large numbers of nymphs of this genus, but the difficulty of specific determination has made it seem wiser not to assign these nymphs a specific rank. However it is to be noted that this genus is well represented in Western Montana.

Clioperla ebria Hagen

A. Potomac ..... NC
N. Rattlesnake Creek, Missoula ..... GBC

Paraperla frontalis Banks

A. Beaver Creek ..... NC

Acroneuria pacifica Banks

A. Bridger Mts. ..... NC

A. pumila Banks

A. No locality ..... NC

A. theodora Needham and Claassen

A. Gallatin Mts. ..... NC
A. Gallatin Mts., Yellowstone Park ..... NC

PERLODIDAE

Isogenus elongatus Hagen

A. Bozeman ..... NC

Perlodes americana Klapalek

A. Bozeman ..... NC
N. Rattlesnake Creek, Missoula ..... GBC

Perlodes signata Hagen

N. Rattlesnake Creek, Missoula ..... GBC

NEMOURIDAE

Nemoura californica Claassen

A. Bouter's ranch ..... NC

N. coloradensis Banks

N. Bozeman C

N. cinctipes Banks
A. and N. Rattlesnake Creek, Missoula ..... GBC

LEUCTRIDAE

Leuctra forcipata Frison
A. Rattlesnake Cr. Dam ..... GBC
Leuctra occidentalis Banks
A. Avalance Cr. Camp, Glacier Nat. Park ..... GBC
Perlomyia sp.
A. Yellow Bay, Flathead Lake ..... GBC

CAPNIIDAE

Capnia crinita Needham and Claassen
A. Bozeman ..... NC
C. projecta Frison
Bitterroot River, Near Florence ..... GBC
C. elongata Claassen
A. Bitterroot River, Near Florence ..... GBC
A. Rattlesnake Creek, Missoula ..... GBC

NEW PSYLLIDS FROM ALBERTA (PSYLLIDAE, HOMOPTERA)

BY JOHN S. CALDWELL
Ohio State University, Columbus, Ohio.

The following descriptions are based on specimens collected by Mr. E. H. Strickland in Alberta, Canada. All holotypes and allotypes are deposited in the Canadian National Collection at Ottawa, Ontario. Paratypes are in the

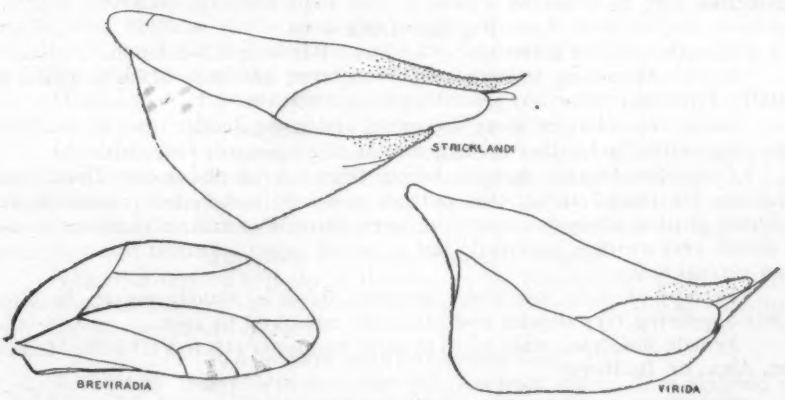

Fig. I. Lateral aspect of female genitalia of *Psyllia stricklandi* n. sp. and *Psyllia virida* n. sp. and forewing of *Phyllopiecta multidubiata breviradia* n. var.

collection at the University of Alberta, Edmonton, and in the Caldwell collection at Ohio State University, Columbus.

Phyllopiecta multidubiata n. n.

Attention has been called to the fact that the name *salicis* as used by Mally in describing his *Trioza* is not available even after a generic shift; therefore, the writer takes this opportunity to propose the name *multidubiata* in place of *salicis* which was used in Ohio Biological Survey Bulletin No. 34, 1938.

Phyllopiecta multidubiata breviradia n. var.

Length to tip of forewing 2.5–2.7 mm.; forewing 2.2–2.5 mm.

Color: Head and thorax appearing red-orange, abdomen dark, antennae black distally, genal cones sometimes black.

Structurally resembling *multidubiata* except for shorter and more rounded forewing and the remarkable short radial-sector making the forewing very similar to *Trioza* 4-*punctata* Crawf.

Female *holotype*, male *allotype*, and *paratypes* taken from *Shepherdia canadensis*, V-31-38, Edmonton, Alberta.

Psyllia stricklandi n. sp.

Length to tip of forewing 4.–4.2 mm.; forewing 3.–3.7 mm.

Color: Head yellow; antennae yellow with joints and terminal segments blackish; eyes black; thorax yellowish-brown; forewing yellowish with yellow veins; abdomen greenish overcast with brown.

Antennae about one and a half times as long as width of head. Genal cones divergent, bluntly rounded at apices, as long as vertex. Forewings twice as long as broad; pterostigma long, very narrow; Cu 1 not highly arched.

Genitalia: Female segment longer than rest of abdomen. Dorsal valve much longer than ventral; styliform for caudal half; apex gently elevated, sharply pointed; styliform portion minutely but extremely roughened. Ventral valve evenly contoured ventrally; dorsal margins narrowed for apical third, minutely roughened. Lateral plates very long, narrowly elliptical.

Forceps in male appearing evenly arched and of even width in caudal aspect; in lateral aspect appearing straight and parallel margined.

Holotype female, *allotype* male, and *paratypes* taken VII-22-38, Columbia Ice Field (6700), Alta., on *Shepherdia canadensis*, also *paratypes* from Edmonton and Evansburg 1937-38.

The writer takes pleasure in naming this species in honor of Mr. E. H. Strickland.

Psyllia virida n. sp.

Length to tip of forewing 3.–3.5 mm.; forewing 2.7–3.3 mm.

Color: Appearing yellow-green throughout; antennae black at joints and distally; forewings yellowish; genital segment brownish.

Genal cones longer, more divergent, and more slender than in *stricklandi* Forewings with Cu 1 rather arched, similar to *carpinicola* Crawford.

Genitalia: Female segment longer than rest of abdomen. Dorsal valve styliform for caudal third, this portion minutely roughened; caudal half of styliform portion abruptly turned up; apex blunt. Ventral valve almost as long as dorsal; very strongly hooked dorsad in lateral aspect. Lateral plates no longer than ventral valve.

Forceps of male attenuate in apical third in caudal aspect; in lateral aspect appearing very slender and gradually narrowed to apex.

Female *holotype*, male *allotype*, and *paratypes* taken VIII-7-38. Medicine Hat, Alta., on Bullberry.

FURTHER NOTES ON PSYLLIDAE TAKEN IN ALBERTA. (HOMOPTERA)

BY E. H. STRICKLAND,
University of Alberta, Edmonton.

In 1938 (1) we recorded twenty-eight species of Psyllidae which had been captured in Alberta. Of these, twenty-one were taken, for the first time on record, during the summer of 1937. Although psyllids were far less numerous in 1938 than they had been in 1937, it is now possible to add eleven additional records to the list of species which occur in this province. These include three previously undescribed forms all of which are described by Caldwell in an accompanying article. We are indebted to Mr. Caldwell, also, for the determination of the other species here recorded.

A few additional data were obtained on one or two of the species listed in 1938. The names of these appear in brackets when reference is made to them.

Although attempts were made to observe abnormalities in the growth of the plants on which the various species were taken in the largest numbers, we have nothing specific to record. Neither were we able to gain much information regarding immature stages. This, probably, was due in part to the relatively small numbers of adults which were found in sweeping vegetation. Any nymphs which may have been present in small numbers would not be very easily found.

During the winter of 1938-39, a representative collection, consisting of about a hundred specimens which had been taken during intensive sweeping in alfalfa by Dr. R. W. Salt, of the Dominion Entomological Laboratory at Lethbridge, was submitted for determination. Since the bulk of these had been taken in the vicinty of Lethbridge where very little previous collecting in this family had been accomplished, it was anticipated that a number of new records for the province might be forthcoming. With one exception, however, all proved to be species which had already been taken from various weeds or trees in the vicinity of Edmonton. *P. cockerelli* was represented by very few specimens. The newly recorded species was determined by Caldwell as *Arytaina ribesiae* Cwfd. Since, as its name implies, this species is associated with currants, it would appear that none of the species taken have any direct relationship with alfalfa.

Aphalara fumida Cald.

Edmonton, Evansburg, High Prairie, St. Paul. June. Adults of this species, which collect during June at the base of the buds and flowers of fleabane were found wherever this plant was examined. By the end of the month all were dead. Many had turned black and were attached to the stems. A single final nymphal exuvium, attached to a leaf, probably belonged to this species and suggests that fleabane is the true host plant. Though fleabane was examined periodically from the end of June until the beginning of October, there were no further indications of the presence of this species.

Host; *Erigeron philadelphicus* (Fleabane).

Aphalara gutierreziae Kly.

Medicine Hat. August. One specimen only was taken in sweeping gumweed (*Grindelia squarrosa*). Intensive sweeping of this plant in several localities failed to produce further specimens. Caldwell states that the single specimen submitted is certainly very close to this species but may not be identical.

(Aphalara nebulosa kincaidi Ashm.)

The discovery of nymphs of this species on Fireweed in June establishes this as the host plant of the American variety of *nebulosa* which is in conformity with that of the European form.

Aphalara manitobaensis Cald.

Wabamun. May. One specimen only has been taken. It is believed that it was taken from myrtle leaved willow.

Calophya triozomima Schw.

Medicine Hat. August. Adults of this pretty little green and black species were abundant on scattered sumach bushes which grew on a river bank. No nymphs were taken but Crawford (2) records the species exclusively from this host.

Host, *Rhus trilobata* Nutt. (Sumach).

(Paratrioza cockerelli Sulc.)

In August reports were received to the effect that several adjacent gardens in Edmonton were showing signs of potato yellows. A careful examination of the supposedly affected plants failed to reveal any psyllids with the exception of a few *Psyllia negundinis* adults which had evidently scattered from some nearby Manitoba maples. Two greenhouses in the vicinity, in which tomatoes were growing, showed no signs of infestation. Although the range of this insect is

increasing in southern Alberta, the infestation resulting from an importation into Edmonton in 1936 appears to have died out completely.

Trioza frontalis Cwfd.

Edmonton. May. On May 11 adults of this species were congregated in very large numbers on a few small spruce trees growing in a garden. At about sundown they were flying freely around the trees but appeared always to come to rest on them in preference to saskatoon bushes which grew a few yards away. The latter were not then in leaf. By May 26 all had apparently deserted the spruces and they were even more abundant on the neighboring saskatoon bushes which are considered to be their host plant. The suggestion is that they overwinter on the spruces.

Host, *Amelanchier alnifolia* (Saskatoon), taken on *Picea glauca* (Spruce).

(Trioza quadripunctata Cwfd.)

The presence of numerous green or green and yellow adults on nettles during the summer of 1937 has already been recorded. On May 24, 1938, nettles which were about three inches high were swept at Wabamun. Four unusually dark adults were captured. Crawford states that overwintering forms are much darker than those taken in the summer but these appeared to be exceptional in this respect. Two of the specimens were quite black with contrasting dull yellow areas at the base of the wings and along the sutures of the abdomen. The legs, a cloudy pattern on the mesonotum and the lateral margins of the vertex were also of a smoky yellow colour. Although later in the year a few typically light coloured adults were taken elsewhere on nettles, no nymphs could be found in repeated examinations.

(Trioza varians Cwfd.)

In May, 1937, a few practically black adults were found on willows around a small dry meadow near Edmonton. We were unable to see that these differed structurally from typical green *varians* which were found in large numbers, later in the season, only on willows which grew close to water. Caldwell wrote with regard to these dark forms that Oman, to whom he had submitted them, stated that they were larger than typical *varians* and he suggested that they might represent a new species.

The whole body, including the antennae, cones and legs is deep black with the exception of a slightly reddish area along the sides of the pleurae and a well defined red to yellow margin to the vertex. Similar specimens were taken in the same place in May, 1938, but they disappeared soon after the bushes were in full leaf.

Phyllopiecta multidubiata breviradia Cald.

Edmonton. May to June. Adults were taken scatteringly from a number of bushes of Buffalo berry.

Nominal host; *Shepherdia canadensis* (Buffalo berry).

Phyllopiecta multidubiata Cald.

Edmonton. May. At about sundown on May 11, a few adults of this species were flying around spruce trees in company with numerous *T. frontalis*. Two days later none could be obtained in the same locality.

Psyllia alni americanella new name.

The varietal name *americana*, applied to this form by Crawford (2, p. 156), is preoccupied by his *P. americana* on page 147 of the same publication. For this reason a modification of the former is herewith proposed.

Last year we recorded with some hesitation that we had taken this species in large numbers from swamp birch at Nordegg in 1936. Both Crawford and Klyver give alder as the host plant and, in 1937, we found them exclusively on alders at Athabasca even though swamp birch was abundant in the vicinity. This year they were abundant on swamp birch which grew at an elevation of 6,700 feet near the edge of the Athabasca glacier in Jasper Park.

Psyllia cerasi Patch.

Edmonton. September. Both sexes were taken in association on wild cherries which grew in a sandy area near Edmonton. The foliage of all of the bushes on which they were found had turned, and the highly pigmented psyllids blended perfectly with the red of the leaves. The females alone possessed the conspicuous black bands on the bright red and yellow abdomen which were given as a distinguishing character of this species by Patch (3) who had only this sex before her when she drew up her description. All of the males tended to assume a rosy tint, which was most pronounced on the thorax. The abdomen was unmarked. Many of these males were indistinguishable from those of *P. cerasi astigmata* Cwfd. which is discussed below.

Nominal host; *Prunus melanocarpus* (Choke cherry).

Psyllia cerasi astigmata Cwfd. (new combination).

Wabamun. July. A few adults were scatteringly present on the leaves of cherries in July. Although the prevailing colour was green, a few of the specimens had a rosy tint on the thorax. This was observed in both sexes. There was no sign of black marks on the abdomens of the females. Crawford (2), in his description of *astigmata*, refers to its structural similarity with *cerasi*, but distinguishes the two forms on colour. It is unfortunate that *cerasi* has priority over *astigmata* since the former is undoubtedly a colour variety of the latter and the peculiarities are apparently confined to one sex only. Our observations indicate that it is an overwintering form.

Nominal host; *Prunus melanocarpus* (Choke cherry).

(**Psyllia magnicauda** Cwfd.)

Wolf willows, growing near Wainwright, were extremely heavily infested with this species. Nymphs and adults crowded around the junction of the old and the new growth. It is possible that their presence somewhat stunted the new growth but no other symptom could be observed.

Psyllia stricklandi Cald.

Edmonton, Evansburg, Athabasca Glacier 6,700 feet. June to July. On June 20, 1937, numerous adults of this species were present on buffalo berry bushes at Edmonton. Two days later, and for the rest of the season, none could be found. Intensive sweeping in this locality during May and June, 1938, failed to reveal either nymphs or adults. The latter were, however, abundant on these bushes growing near the Pembina River at Evansburg early in July and later in the month were taken in large numbers on very stunted bushes growing near the Athabacsa Glacier in Jasper Park.

Nominal Host; *Shepherdia canadensis* (Buffalo berry).

Psyllia virida Cald.

Medicine Hat. August. Adults and a few nymphs were taken from bull berry bushes growing by a small stream at Medicine Hat. They so closely resembled *P. magnicauda*, which heavily infests the related wolf-willow, that they were believed to be the same species and no nymphs were preserved.

Host; *Shepherdia argentea* (Bull or Bear Berry).

(**Psyllia floccosa** Patch.)

Typical flocculent nymphs, agreeing with the description by Patch (4), were found freely on alders. The green nymph with a black abdomen which was taken in association with this species in 1937 was not again encountered.

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A NEW RACE OF PAPILIO BELONGING TO THE MACHAON COMPLEX*

BY J. McDUNNOUGH,
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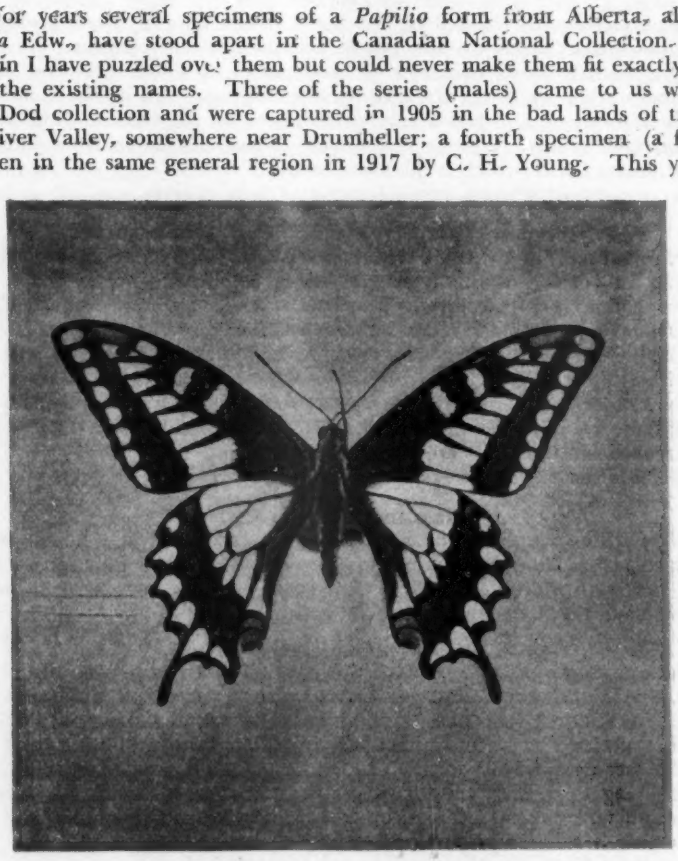
For years several specimens of a *Papilio* form from Alberta, allied to *oregonia* Edw., have stood apart in the Canadian National Collection. Time and again I have puzzled over them but could never make them fit exactly under any of the existing names. Three of the series (males) came to us with the Wolley-Dod collection and were captured in 1905 in the bad lands of the Red Deer River Valley, somewhere near Drumheller; a fourth specimen (a female) was taken in the same general region in 1917 by C. H. Young. This year the



P. machaon dodi var. nov. Holotype, ♂.

receipt of a further similar male from Rutland, Sask., a small town on the Saskatchewan–Alberta border just south of Manitou Lake, leads me to suspect that we are dealing with a fairly well defined race (as races go in this group) which I describe as follows:—

Papilio machaon var. **dodi** var. nov.

Upper side maculation much as in v. *hudsonianus* Clark and *oregonia* Edw. The black area at the base of primaries above is intense in coloration and not so obscured by yellow sprinkling as is the case with the allied forms; the yellow color is also somewhat deeper, as in *zelicaon*. The outer margin of fore wing is much as in *oregonia* and scarcely as rounded as in *hudsonianus*. The yellow bar in the cell is narrower than usually found in its allies. On the secondaries the yellow area does not extend as far beyond the broad black discal

*Contribution from the Division of Entomology (Systematic Entomology), Department of Agriculture, Ottawa.

dash as is usually the case with *oregonia* and *hudsonianus* and in consequence the two spots defined by the black veins are comparatively small. The marginal yellow lunules are large and only slightly concave on outer margin. The orange anal spot is *not* pupilled with black (distinguishing character from *zelicaon*) but shows a black curved line of varying thickness *along lower margin;* in the holotype this is much as in typical *machaon* but in other specimens it thickens to a bulbous spot distally, as often occurs in both *hudsonianus* and *oregonia.* The tails are much as in *oregonia* and longer than those of *hudsonianus.* The underside is without the yellow shading at base of primaries (faintly shown in allotype) characteristic of *oregonia* and frequently found in *hudsonianus.* The size is larger than that of the average *hudsonianus* and equal to that of rather small *oregonia,* being 75-80 mm. from tip to tip of fore wing. The abdomen is much less hairy than that of *hudsonianus* and very similar to that of *oregonia* in that the broad yellow lateral area is sharply defined and not at all obscured by blackish sprinkling.

Holotype—♂, Red Deer River, Alta. (50 miles N. E. of Gleichen), July 5, 1905, (F. H. Wolley-Dod); No. 4913 in the Canadian National Collection.

Allotype—♀, Red Deer River, Alta., July 8, 1917 (C. H. Young).

Paratypes—2 ♂, same data as holotype, July 5-6. 1 ♂, Rutland, Sask., 1939 (no further date).

I take much pleasure in dedicating this race to Mr. F. H. Wolley-Dod, one of the pioneer lepidopterists of Alberta.

ON SOME NEARCTIC SPECIES OF AGABUS, WITH THE DESCRIPTION OF A NEW SPECIES. (COLEOPTERA: DYTISCIDAE) *

BY HUGH B. LEECH
Vernon, B. C.

Agabus elongatus (Gyllenhal).

Dytiscus elongatus Gyllenhal, 1827, Ins. Suecia, 4:381.
Agabus bryanti Carr, 1930, Can. Ent., 62:278. *syn. n.*

The possibility of the above synonymy was suggested in a letter from Mr. W. J. Brown of Ottawa. Through the kindness of Dr. K. G. Blair and Mr. J. Balfour-Browne of the British Museum, I have been able to study a male and a female of *A. elongatus* (Gyllenhal), and to compare them with two male and two female paratypes of *A. bryanti* Carr. The late Mr. F. S. Carr apparently knew *elongatus* only by description; upon examination of that species, it was found that the points on which he depended to separate *bryanti* (the shape of the anterior tarsal claws, and the serrate condition of the antennae, in the male), are exactly the same in the two species.

Agabus antennatus nom. nov.

Agabus clavatus Leconte, 1859, Smithson. Contr. Knowl., 11:4. (*nec clavatus* Latreille, 1804:166).

While glancing through Volume 8 of Latreille's "Histoire Naturelle, generale et particulière, des Crustaces et des Insectes" (1804, Paris), I was greatly surprised to find a *Dytiscus clavatus* Latr. This name appears to have been missed by later workers, and is not included in Sharp's monumental volume on the Dytiscidae (1882), in Zimmermann's list of the Dytiscidae (Coleopterorum Catalogus, Pars 71, 1920), or in any other papers which I have examined. Latreille's description is quite full enough to be valid, and seems to be that of a species of *Agabus,* although the size of the types is not given. Mr. J. Balfour-Browne, to whom I appealed for aid, writes as follows (letter dated May 4, 1938): "With regard to the *Dytiscus clavatus* Latreille that you mention, I have looked up the reference and searched through much of Latreille's work and have been unable to find any other mention of this species. There is one clue and one clue only which points, I think, quite clearly to the species being an *Agabus.* In the

*Contribution from the Division of Entomology, (Forest Entomology) Dominion Entomological Branch, Vernon, B. C.

discussion of the *following* species.....No. 13, D. vitré, *Dytiscus fenestratus* Oliv., occur the words '.....Il est aussi grand que le précédent et de la même taille;..... .....'.Well, according to Zimmermann, *fenestratus* Oliv. = *ater* Degeer but the size is 14 mm. *Agabus* (s. str.) *clavatus* Leconte is 8 mm., *clavicornis* Sharp is 10½ mm., and *serricornis* Payk. is 11 mm. Accordingly this does not seem to fit, but on turning to Olivier I can see nothing that is incompatible with *fenestratus* being truly the Fabrician species, i. e. 11 mm. long. In the concluding line of the description of Latreille's *clavatus* occur the words 'cet insecte se trouve en Suède'. We have then a Swedish species about 11½ mm. long, and this suits, particularly in the description of the antennae, *Agabus serricornis* Paykull. In subsequent volumes there is a silence about this species till we come to Latreille in Cuvier's Regne Animal, iii. 1819, p. 210, where a species 'D. a. antennes en scie' or *serricornis* is mentioned. I judge from this that Latreille had come to the conclusion that his *clavatus* was the same as *serricornis* Paykull which has clear priority over Latreille's species; the latter accordingly becomes a simple synonym. Having thus autheticated *clavatus* Latreille, Leconte's species, as you suggest, requires a new name as a *nom. praeocc.*"

As Brown has pointed out (1931: 116), *antennatus* differs greatly from *Agabus s. str.*, (*serricornis* Payk., *clavicornis* Shp., *verus* Br.) and though the antennae of the male are clavate, there is a serious doubt that it should be associated with these species.

Agabus moestus (Curtis).

Colymbetes moestus Curtis, 1835, in Sir John Ross' Narrative of a second voyage in search of a North-west Passage, etc., Appendix, Nat. Hist. section, p. lx.

? Gaurodytes nigripalpis Sahlberg, 1880, Svenska vet. Ac. Handl., 17: 56. *syn. n.*

Agabus borealis Sharp, 1882, Sci. Trans. Roy. Dublin Soc., (2) 2:513. *syn. n.*

Although the species was described from Arctic America, the name *moestus* of Curtis seems to have been missed by American workers. The above synonymy is established on a male specimen in the British Museum (Nat. Hist.), which bears labels as follows: (i) *C. moestus* Curt. e. coll. Curtis. Cape Ross. (ii) e. coll. Curtis. (iii) *Colymbetes moestus* Curt. Cap. Ross. (iv) *Agabus nigripalpis* Sahlb. ♂, det. J. Balfour-Browne. Mr. Balfour-Browne believes that label number three is in Curtis' handwriting, and that the specimen is probably from the original series. Authentic specimens of *nigripalpis* are apparently still unknown in most collections and the synonymy is included here on the authority of Sharp (1882, p. 974) and Zimmermann (1934, p. 69). Sharp considered his *borealis* to be a synonym of *nigripalpis;* Mr. Balfour-Browne has examined the types of *borealis,* and says definitely that the species is a synonym of *moestus.* The *A. dissimilis* Sahlb. quoted by Sharp (loc. cit., p. 513) is apparently a manuscript name only.

According to Mr. Balfour-Browne, the specimens recorded by Blair (1933, p. 94) from Akpatok Island as *semipunctatus* (Kirby), are actually *moestus* (Curtis).

Agabus erichsoni Gemminger & Harold.

Agabus nigro-aeneus Erichson, 1837, Käfer der Mark Brandenburg, i:157 (*nec nigro-aeneus* Marsham, 1802, p. 428).

Agabus erichsoni G. & H., 1868, Cat. Coleopt., 2:454.

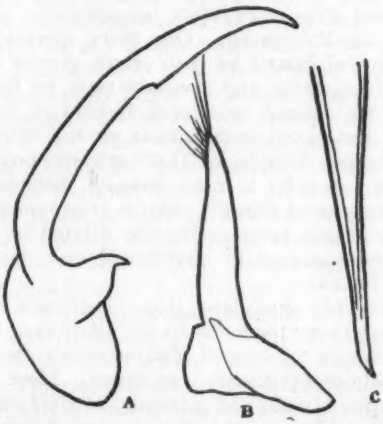
Mr. Balfour-Browne has examined the type of Marsham's *Dytiscus nigro-aeneus* for me, and has confirmed that it is a synonym of *Agabus chalconatus* (Panzer). Since Marsham's *nigro-aeneus* antedates Erichson's by thirty-five years, it is obvious that the latter's species requires a new name; this was supplied in 1868 by Gemminger and Harold but for some reason most authors still use *nigro-aeneus* Erich.

Agabus velox n. sp.

Male. Length 6.5 mm., width 3. 1 mm. Body elongate, subparallel, moderately convex, shining. Black, aenescent; head with labrum, clypeus and two spots on the vertex reddish-brown; lateral marginal bead of pronotum vaguely reddish; elytra with a small elongate post-median sublateral pale spot; antennae and palpi yellowish-brown, the terminal segments infuscate; black beneath, the metacoxal plates distinctly aenescent; prolegs yellowish-brown, the femora slightly darker, meso- and metalegs progressively darker.

Head two-thirds as wide as pronotum, meshes of the surface reticulation small and unequal, irregular in shape; all antennal segments a little longer than broad.

Pronotum one-third as long as broad, broadest at base, the sides evenly arcuate; lateral marginal bead rather narrow, almost obliterated anteriorly, basally about half as wide as a median antennal segment; sculpture a little coarser than on the head, the meshes becoming smaller laterally; disc with a small median impression, and two vague ones slightly lateral and anterior to it.



Agabus velox n. sp., male genitalia. A. median lobe (aedeagus) in profile. B. right paramere, outer side. C. apical half of aedeagus, ventral view (i.e. convex side of upper part of Figure A.).

Elytral outline only slightly discontinuous with that of pronotum, widest at posterior third, feebly arcuate; meshes of reticulation smaller than those of pronotal disc, very irregular as to size and shape, becoming indistinct towards sides and apex; serial punctures coarse, confused apically.

Prosternal process narrow, bluntly pointed, subangulately convex, sparsely pubescent. Metasternal wings moderately broadly triangular, least distance between mesocoxa and metacoxal plate exactly one-half the width of the latter, measured along the same line. Third apparent abdominal sternite with a slightly tumid oblique area on each side of the middle, and halfway between the middle and the sides, the surface of these areas with a number of subparallel curved impressed lines. Each sternite with a few irregularly placed punctures medially, those of the apical segment much coarser and more numerous. Anterior (inner) protarsal claw a little more strongly curved than the outer one, and with a small sharp tooth near the base; first three segments of pro- and mesotarsi moderately dilated, the first most broadly so, and each provided beneath with pads, the hairs of which are enlarged apically to form small circular

palettes; metatibia with a series of irregularly spaced spiculiferous punctures close to and paralleling the venteral margin of the outer face. Male genitalia as figured.

Female. Similar to the male except as follows: elytral sculpture coarser, and more deeply impressed; tarsi not sexually modified; punctures of apical abdominal sternite smaller and less numerous.

Holotype—♂, Churchill, Manitoba, August 18, 1937 (W. J. Brown). No. 4545 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, June 28. In the Canadian National Collection.

Paratypes—20 ♂♂, 9 ♀♀, all from Churchill, Man., (W. J. Brown), collected on various dates between June 18 and August 18. Distributed as follows: 9 ♂♂, 7 ♀♀ in the Canadian National Collection; 1 ♂ in the British Museum (Nat. Hist.); 1 ♂ in the California Academy of Sciences (Ent.); 1 ♂ in the Museum of Comparative Zoology; 1 ♂ each, to Dr. H. C. Fall, and Messrs. J. Balfour-Browne, R. Hopping, J. B. Wallis; 4 ♂♂, 2 ♀♀ in the author's collection. The paratypes measure from 6.1 to 7 mm. in length.

A. velox belongs to a group containing *semipunctatus* (Kirby) and *falli* (Zimmerman) (=*sharpi* Fall, 1922, *nec sharpi* Jacobson, 1908; and *falli* Guignot, 1935) in our fauna, and *affinis* (Paykull), *unguicularis* (Thomson) and *biguttulus* (Thomson) in the Palaearctic. Our three species may be separated at once from those of the Palaearctic by their much greater convexity. *A. falli* is readily distinguished from *velox* and *semipunctatus* by having the lateral bead of its pronotum strongly defined anteriorly, instead of almost obsolete; in addition the male lacks the raised striate areas on the third abdominal sternite, having instead the anterior margin of this segment somewhat raised on each side of the median line. *A. velox* is more elongate, more strongly aenescent, and much more coarsely sculptured dorsally than is *semipunctatus;* in the male, the pro- and mesotarsi are almost twice as broadly dilated in *velox;* females of the two species are readily separated by the elytral reticulation, which is fine in *semipunctatus,* coarse in *velox.*

Sharp described his *stridulator* from "Hudson's Bay". Mr. J. Baffour-Browne examined Sharp's type for me as to the dilation of the male tarsi; he also remounted and re-examined the type of *semipunctatus* (Kirby), which proves to be a male, not a female as previously considered. More recently I have been able to study two cotypes, a male and a female, of *stridulator,* and I agree with Arrow (see Fall, 1922, p. 18) that the species is a synonym of *semipunctatus.*

Acknowledgements. I am much indebted to Mr. J. Balfour-Browne of the British Museum (Nat. Hist.), for the loan of specimens, and for the examination of certain literature not available to me; Mr. W. J. Brown of Ottawa has generously allowed me to study the *Agabus* here described as *velox* n. sp.; in addition, Mr. J. B. Wallis, Dr. E. C. Van Dyke, Mr. R. Hopping and Mr. G. Stace-Smith have loaned specimens from their private collections.

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AN APPARENTLY NEW EPIPASCHID FROM NOVA SCOTIA (LEPID.)*

BY J. McDUNNOUGH,
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For several years, as a result of various Insect Faunal Surveys in Nova Scotia, material of an undetermined Epipaschid of the genus *Tetralopha* has been accumulating in our collection. On a recent visit to Washington I could not match the species with any named material in the United States National Museum; in general appearance it is fairly close to Hulst's unique type of *talleolalis* but very considerably larger; although of approximately the same size as *robustella* Zell. it cannot be mistaken for this species on account of the very definitely geminate t. a. line, the paler median space and the clearly cut t. p. line, which latter character would also separate it from *militella* Zell. It is probable that the larva feeds on spruce or an allied coniferous tree, as our specimens were mostly taken at light in localities where spruce was predominant. As our 1938 collections in Cape Breton contained a small series of specimens in excellent condition and of both sexes, I am taking a chance that the species is undescribed and describe it as follows:

Tetralopha maritimalis n. sp.

Male. Palpi thin, recurved, pale smoky, heavily sprinkled with white on second joint, which encloses a strong pencil of smoky hairs. Antennae thin with moderately long ciliations, basal scale-tuft moderate, grayish-white, tinged with ruddy. A small tuft of rough hair on rear of head is tinged with ruddy brown. Squammation of collar and thorax consisting of large, appressed, gray-brown scales, intermingled with hair, and variably tinged with ruddy-brown; traces of black tufting on mesothorax medially. Abdomen pale ochreous, banded anteriorly on each segment with purple-black. Forewings with basal section to t. a. line black-brown, sprinkled with white and shaded with ruddy-brown on lower half; a raised black scale-tuft in central portion. T. a. line outwardly oblique, blackish, geminate, especially above inner margin, where it is distinctly white-filled, interrupted in the cell by the usual hyaline streak which characterizes the males. Median space broad, whitish, strongly sprinkled with smoky in outer two-thirds, the white predominant in a broad band on inner lower portion next t. a. line; a dark costal patch giving rise to an indefinite (and generally quite obscure) dark median line, angled outwardly in cell and continued in lower portion by some mixed raised, black and white scaling; veins 3—5 faintly outlined in black-brown (variably distinct). T. p. line in general upright, blackish, clear-cut, outwardly bulging opposite cell and with slight inward angle at vein 2, very faintly dentate outwardly opposite cell, bordered outwardly with a fine, distinct white line. Subterminal space purplish or ruddy-brown, with smoky rays projecting outward along the veins into the terminal space which is heavily sprinkled with white scaling. A broad black terminal line.

*Contribution from the Division of Entomology (Systematic Entomology), Department of Agriculture, Ottawa.

broken on the veins by minute white dots and bordered outwardly at base of fringes by a fine white hair-line. Fringes deep smoky. Secondaries deep smoky, paling basally, with traces of a dark curved postmedian line. Fringes whitish with smoky basal line. Beneath, primaries deep smoky, except broadly along inner margin, with the usual scaling below costa in basal half of wing; secondaries paler, smoky-sprinkled, with more distinct slightly dentate postmedian line and a small dark dot in cell near base of wing. A diffuse terminal dark line on both wings. Fringes smoky. Expanse 22 mm.

Female—Very similar to male except for lack of secondary sexual characters. T. a. line more prominent on primaries as it continues uninterrupted across cell; beyond it in cell is a small, raised dark discal dot, surrounded by slight raised white scaling. Expanse 23-25 mm.

Holotype—♂, Baddeck, N. S., July 21, 1938, (T. N. Freeman); No. 4548 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, July 25.

Paratypes—3 ♂, same data, July 20, 21; 3 ♂, Baddeck, N. S., July 23, 1936, (T. N. Freeman); 1 ♂, White Point Beach, N. S., Aug. 3, 1935, (J. McDunnough); 2 ♀, Baddeck, N. S., July 26, 1938, (T. N. Freeman).

There are also single worn males from Fredericton, N. B. and Mer Bleue, Ottawa, Ont. before me.

NOTICE OF POSSIBLE SUSPENSION OF THE RULES OF NOMENCLATURE IN CERTAIN CASES

The following notice, signed by Francis Hemming, Secretary to the International Commission on Zoological Nomenclature, has been received under date of June 27, 1939.

In accordance with a Resolution adopted by the International Zoological Congress at their Ninth Meeting held at Monaco in 1913, prescribing that not less than one year's notice is to be given by the International Commission on Zoological Nomenclature of all applications received for the "Suspension of the Rules", the attention of the zoological profession is hereby invited to the fact that requests for the "Suspension of the Rules" have been received by the Commission in the undermentioned cases:—

(a) ECHINODERMATA.—*Diadema* Humphreys, 1797 (type *Echinometra setosa* Leske, 1778) to be added to the Official List of Generic Names (see Mortensen, 1937, Ann. Mag. Nat. Hist. (10) 19: 463-469 (reference Z. N. (S.) 52).

(b) INSECTA, Neuroptera.—To be added to the Official List of Generic Names with types as shown in brackets:—*Hemerobius* Linnaeus, 1758 (*Hemerobius humulinus* Linnaeus, 1758); *Chrysopa* Leach, 1815 (*Hemerobius perla* Linnaeus, 1758) (see Cowley and others, 1937, Generic Names of British Insects, Pt. 4) (reference Z. N. (S.) 42).

(c) INSECTA, Lepidoptera.—To be added to the Official List of Generic Names with the type as shown in brackets:—*Actinote* Hubner, 1819 (*Papilio thalia* Linnaeus, 1758) (see Hemming, 1936, Proc. R. Ent. Soc. Lond. (B) 5: 56-57) (reference Z. N. (S.) 63).

(d) REPTILIA.—*Bitis* Gray, 1842 (type *Vipera* (*Echidna*) *arietans* B. Merrem, 1820) to be added to the Official List of Generic Names, and *Cobra* Laurent, 1768, to be suppressed (Stejneger, 1936, Copeia 3:140) (reference Z. N. (S.) 121).

In adopting the Resolution referred to above, the International Zoological Congress expressly stated that their object was thereby to render it possible for zoologists, particularly specialists in the group in question, to present to the Commission arguments for or against the suspension of the rules proposed. Any such representations should be furnished to the Secretariat to the Commis-

sion, British Museum (Natural History), Cromwell Road, London, S. W. 7, as soon as possible and in any case within one year ot this day's date. Every such communication should be clearly marked with the Commission's reference number as given above.

BOOK NOTICES

A Classification of the Larvae and Puparia of the Syrphidae of Illinois, exclusive of Aquatic Forms. By Elizabeth M. Heiss, Univ. Illinois Bull. 1938, vol. XXXVI, No. 1, 142 pp., 16 pls. (Ill. Biol. Monographs XVI, No. 4).

This is an important contribution to the taxonomy of the early stages of Diptera and supplements Johannsen's work on aquatic Diptera, Part II, in which the immature stages of aquatic Syrphidae were included.

Following the historical account in which special reference is made to the pioneer work of C. L. Metcalf as the first attempt to classify the immature stages of Syrphidae, the author gives a detailed analysis of the general characteristics of the egg, larva and puparium, including descriptions of the three larval types of this family as defined by Metcalf, viz., the aphidophagous, saprophytic and *Microdon* types. The aquatic forms, omitted from this paper, are included in the saprophytic group. Brief notes on food habits and pupariation are given, both in the general section and in the descriptive accounts of the genera and species. The soundness of the classification as based on adult characters is, in general, confirmed by the characters of the larvae. While much variety of larval form obtains throughout the family, marked uniformity prevails within any one genus, except in a few cases such as the *emarginatus* group of the recently described genus *Metasyrphus* (Fluke, 1933) which appears, in the larval stage at least, to represent a distinct genus.

An excellent key is given to the genera treated in the paper and keys to the species in several cases where the larval characters of more than one species are known. Not many larvae are described for the first time, but full descriptions are given of all the species treated where material was available.

The numerous figures of larvae and puparia, including many structural details such as the spiracular plates, are extremely well executed. Among other excellent features are an account of the parasites obtained in the course of rearing the larvae and an appendix giving a list of these parasites under their respective hosts. Parasites are listed from eighteen species of Syrphidae and include species of Ichneumonidae, Chalcididae and Cynopidae (Figitinae).

E. M. Walker.

The Coleoptera of Windsor Forest. By H. St. J. K. Donisthorpe. Nathaniel Lloyd Ltd., London.

Mr. H. St. J. K. Donisthorpe has just issued a very interesting volume of 126 pages, listing the beetles obtained in Windsor Forest, England, as the result of about fifteen years intensive collecting. The list is reprinted from the Entomologist's Monthly Magazine, a fact which I do not find mentioned in the volume. The number of species obtained is about 1,870, with also 87 aberrations and varieties. Previous records included 147 species, of which only 89 were retaken by Mr. Donisthorpe. Studies of this kind bring out the fluctuations in insect populations, a subject which has not been well understood. Certain species, as *Bembidion quadripustulatum* and *Aulonium trisulcum* have increased enormously in the last few years; others have become very rare and have not been met with for a long time. Thus survey work of this kind must be continued indefinitely; it cannot be considered finished, no matter how thorough it may be, because the fauna itself will change. It also appears from the list that certain species may elude capture though actually not rare. Thus the fine elaterid, *Ludius ferrugineus*, 17-20 mm. long, was recorded by Stephens in 1830

as taken by Dr. Leach at Windsor. Yet Mr. Donisthorpe could not find a living adult, although many larvae were taken and the adults reared.

A very remarkable feature is the excessive abundance of Staphylinidae; about 530 species. On the other hand, there are only three Anthicidae, one meloid, five Buprestidae, and six Tenebrionidae. Weevils are very numerous, with no less than 43 species of *Apion*. In the course of the work, Mr. Donisthorpe found 37 species of beetles new to Britain, including eight new species.

Thus this small book, though dealing with the fauna of a limited district in Europe, is of considerable interest to American Coleopterists and Entomologists generally.

T. D. A. Cockerell.

202 Common Household Pests. By Dr. Hugo Hartnack. Hartnack Publishing Co., Chicago, Illinois. 319 pages, numerous illustrations.

This attractively bound volume is in the nature of a compilation of the Chordate and Arthroped forms which may be considered as household pests. Approximately two-thirds of the book is devoted to insects. The remainder of the book consists of introductory matter, short sections on mammalian, avian and non-insect arthropodal pests, general considerations on extermination and fumigation, and an index.

The author, a German, resident for fifteen years in America, considers 'household pests have been treated more or less cursorily in the United States' while many German scientists since the war have carried on painstaking work in this field. Accordingly, more extensive reference has been made to German literature to which Doctor Hartnack had access than to that of America, Canada, England, or other countries. Similarly, the illustrations, many of which are excellent, are largely of German origin or original.

As the author states in the foreword, 'the reader will find the information in this book spotty—for example, it takes the banded roach in Paris and Indiana a certain number of days to hatch but does not give the time elsewhere in the United States. The reason is that 'I did not know the development time anywhere else, though such information may exist'. In a work of this nature many pertinent facts may be omitted due to references being unavailable to the author or to size limitations. Whatever the cause, it is unfortunate that the incompleteness in some respects of this book makes it rather elementary. For example, in the control of cockroaches the author states 'contact and stomach insecticides are very successful emergency measures. Fumigation brings results but is less satisfactory, especially against Oriental roaches'. No mention is made of the insecticides or fumigants used or why fumigation is unsatisfactory.

The author closes the volume with a criticism of some aspects of fumigation, the household pest problem, and entomological publications. The criticisms offered are largely constructive and as such, should be welcomed by those concerned. Fortunately many of the grounds for these criticisms have already been recognized by the proper authorities and steps taken to remove them.

R. H. Ozburn.

Guelph Printing Service

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